



Learning for the Empowerment of High School Girl Students

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Abstract. There is a gender gap between men and women, this is manifested in gender violence and social injustice. An alternative to reduce this gap is female empowerment through learning. This study proposes an IT model for the empowerment of girls in high school education, which is based on Moodle and includes six modules (Administrator, Instructional Team, Mentor, Girl, Learning Tools and Empowerment Test). The proposed model was implemented in a system called EmpowerMe that includes the tools digital library, chatbot, webinar and a game-based learning platform. EmpowerMe was validated through a case study over eight student girls in Huancayo, Perú. The results in the case study show that after two sessions of 1.5 h each, the girls' empowerment improves by 4.18% with the application, in contrast to the traditional method, which improves by 2%, and the usability and satisfaction evaluation show that the EmpowerMe system is rated with an average of 4.43 out of 5 points, obtaining high marks regarding usability, content management, follow-up and user satisfaction.

Keywords: Female empowerment · learning tools · moodle

1 Introduction

Globally, there is a gender gap between men and women, 70% in European countries and 50% in American countries [1], which is manifested in gender violence and social injustice. One out of every three women has experienced violence by a family member or spouse [2], 69% of trafficked persons are women and 5% of these are girls [3].

An alternative to reduce the gender gap is the empowerment of women and girls through learning content that gives them leadership and independence, to know their rights, prevent acts of violence, and know how to report them. Among the efforts for female empowerment are collective intelligence to teach concepts of information and communications technology [4], the construction of individual capacities regarding empowerment [5], pedagogical strategies such as Right To Play to educate children and girls with problems of violence [6], self-help models for collaborative learning in different cultures [38], social education for disabled women [7], prevention of abuse towards young women and older adults [8], the education for women's empowerment in rural India [9, 10]. One effort for female empowerment is the study by [11] that points out that education contributes to female entrepreneurship.

Two aspects are important in female empowerment: educational models and technological tools. Educational models address empowerment from an educational perspective, focusing on high school education. On the other hand, technological tools help to improve skills, knowledge, and participation in social media and networks [12]. However, the various empowerment tools are not focused on girls and adolescents in the high school stage, since, according to UNICEF, in 2015, a considerable percentage of the population are school-age children and adolescents in several developing countries [13].

This study proposes a technological platform to assist in the process of empowerment of girls in high school, providing tools and appropriate educational content so that they can acquire and increase their leadership skills, entrepreneurship, sex education, among others, based on the open source Moodle platform. To measure empowerment, a quantitative instrument is used with questions focused on female empowerment.

This paper is organized into five sections. In Sect. 2, the state of the art on learning applications that contribute to women's empowerment is presented. The e-learning model of the technological proposal and its implementation are described in Sect. 3, respectively. Section 4 describes the validation process. Finally, Sect. 5 shows the conclusions.

2 State of the Art: Learning Systems for Women's Empowerment

The researched literature offers support tools for the process of female empowerment, thus providing alternatives to improve women's knowledge and empowerment at the intellectual level.

Learning management systems (LMS) are defined as software used to create and manage content and environments for online learning, providing an automated and simple way to educate a group of people [14]. In the case of female empowerment, LMSs have been identified that, for the most part, consider an adult age group and rarely a school-age group.

First, the social networks of Facebook and Twitter are useful for data collection when planning to learn about community problems in a society [15]. Secondly, these networks such as Instagram can be used to disseminate educational content by posting pictures to promote good habits in women [16]. Third, systems can focus on e-learning by employing digital storytelling for learning, providing stories and experiences to communities that have a high macho influence [17]. Fourth, to enhance empowerment and provide tools for female entrepreneurship, there are digital financial services that associate women as a key part of society, offering advice on basic financial education to societies with restrictions for women [18]. Fifth, there is the system related to the dissemination of improved and timely information on causes and possible effects after abnormal Pap test results, which affects women who must undergo treatment and need to be empowered to face the healing process [19]. Sixth, there is the PRISMA tool, which provides an innovative and attractive way to access female empowerment content focused on learning and to access health content [20]. Seventh, the European Network for Women in Leadership platform presents a space for professionals to exchange ideas and develop best practices according to their talent [21]. Eighth, The WIE Suite project is a community for women leaders and creators where they can share experiences of success and support among other women

[22]. Ninth, the He For She program belonging to UN Women seeks to generate solidarity for gender equality in all people, equally involving men in communities, families and businesses [23]. Tenth, the SheLeader project is developed by women and companies that contribute to generating a platform for empowerment [24]. Eleventh, the Black Girl in OM project creates a space for Afro-descendant women to have access to content and experiences totally designed for them [25]. Twelfth, the Empower Women program is dedicated to helping women reach their full economic potential, they also inspire both men and women to be activists for gender equality [26].

3 E-Learning MEG

3.1 MEG Model

We propose MEG (Model for Empowerment in Girls), an IT e-learning model to assist in the empowerment process for high school girls, which includes six modules (administrator, instructional team, learning tools, empowerment test, mentor and girl) and three roles (instructional team, mentor and girl) (see Fig. 1).

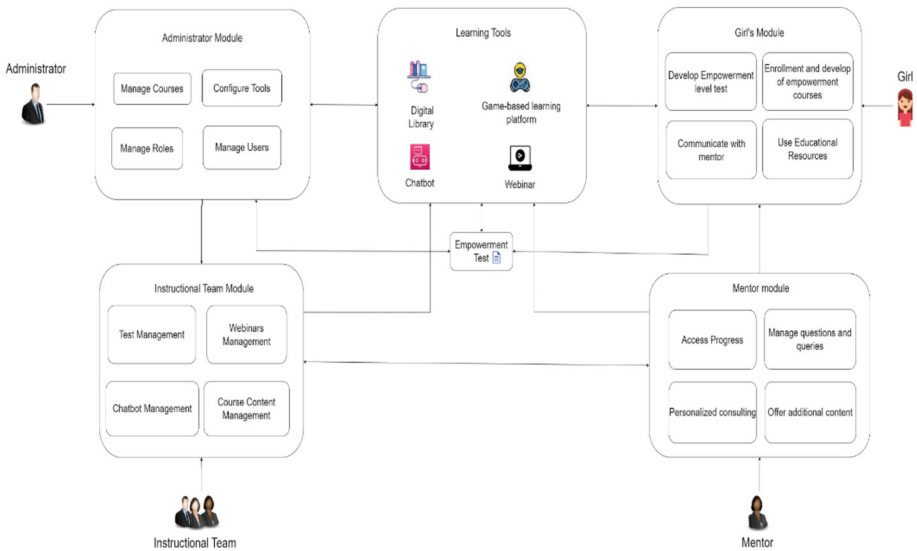


Fig. 1. E-Learning MEG

First, the Administrator manages courses, tools, roles and users. Secondly, the Instructional Team manages the test, chatbot, webinars and the content of the courses so that the girl and the tutor can make use of the platform. Likewise, the instructional team will develop a test to define what level of empowerment the girl is at, by using an instrument that will allow measuring empowerment and knowing her level (high, medium and low). For the present research, the “Instrument for measuring women’s empowerment”

[27] was used. Thirdly, the girl develops the Empowerment Test and enrolls in the available courses, according to the level of empowerment achieved, communicates doubts to the mentor and uses the other educational resources. Fourthly, the Mentor accesses the girl's progress to validate doubts and queries, as well as to generate personalized advice and offer additional content in the digital library, if necessary. Fifthly, the learning tools included are a chatbot, webinar, digital library and a game-based learning platform all managed from Moodle.

3.2 Implementation

The following is a description of the EmpowerMe system (acronym from Empower and Me) implemented by MEG E-Learning to support the empowerment process of high school girls. EmpowerMe has been built on the LMS Moodle, because it has functionalities that allow easy integration with other technological tools, and it consists of five modules that are explained below.

Administrator module. This module is in charge of managing the accounts of the other users, course management, management of the tools integrated to the system, etc.:

- **Manage courses:** The empowerment courses, learning material and evaluative activities that are elaborated by the instructional team will be adapted to the computer language by the administrators, since they have the necessary skills to position each topic within the educational block that best suits to maintain an organized learning and empowerment.
- **Configure tools:** The learning tools must be configured each time the instructional team requires it, since questions and answers must be added to the chatbot, and educational materials must be included in the digital library, among others.
- **Manage roles:** The administrators completely configure the participant role for the girls who are going to develop the empowerment courses and interact with the technological tools, allowing them to access the ideal routes and not be overwhelmed with other functionalities of the system that correspond to the instructional team.
- **Manage users:** Administrators will be able to manage other users who are participants and mentors (register, update and withdraw), enabling permissions as required and providing support to those involved while they remain within the EmpowerMe system.

This (see Fig. 2) implements the Administrator module, that is, it implements the functionalities of managing courses, managing roles, managing users and configuring tools. For the implementation, you must enter as an administrator user and access the control panel. Within the panel, you can manage the courses by entering the "Courses" tab where different options are available for them. Likewise, to manage roles and users, you must enter the "Users" tab within the configuration. In this tab, users can be created, edited or deleted, as well as the roles of each of them. On the other hand, configuring tools is done by entering each course where you will find the option "Add activity or resource" with which you can add the necessary tools for its development.

Instructional team module. Through this module, the instructional team is in charge of managing the content, system activities and resources needed for each topic of the empowerment process. Will be able to manage the following:

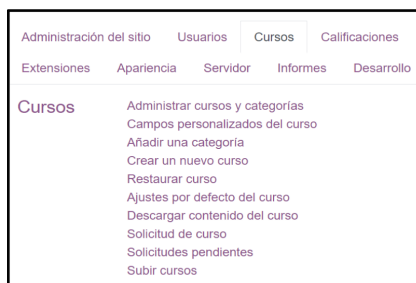


Fig. 2. Administrative management interface

- Manage test: Supervise the application of the empowerment test and suggest courses to increase and reinforce skills. The instructional team is in charge of developing the empowerment test for defining levels using an instrument for this purpose.
- Manage webinars: Develop virtual sessions on topics and courses. In this way, girls have access to a teaching done directly by a professional at a defined time and can access the broadcast of the virtual session. The Google Meet tool was selected to set up the sessions, due to its quick integration with Google Services tools.
- Manage chatbot: In an educational environment, this tool can help to clarify the doubts that girls may have after reading about a complex topic, making the existence of a mentor 24 h a day not indispensable, but the chatbot would be present to solve the most common doubts that a girl may present, leaving the most punctual ones to the mentors in their schedule of answers.
- Manage course content: Develop empowering content, evaluative and developmental activities for the girls.

This (see Fig. 3) allows the enabling and configuration of the interfaces that incorporate the technological tools for learning within Moodle, thus maintaining the educational blocks of the empowerment courses. The mentors are empowered to customize the courses within the system, adding activities and resources to each segment that requires it. In this way, you can choose from a varied group of elements to further nurture the girl's education.

Mentor module. Through this module, the mentor take care of each group of girls according to their level of empowerment, also will be able to manage the following:

- Access progress: Visualize in real time the progress of the girl in her enrolled courses and take actions or support strategies for the girl according to the level of progress that she presents.
- Manage doubts and queries: Through the chatbot, which was previously configured with the answers to the most frequent questions, the participant can communicate with the mentor, through email, also the mentor can use the webinar tool to resolve these doubts and queries, either in a group or personally.
- Personalized advice: The system offers the functionality of personalized advice that is based on the progress, doubts and queries of each girl, being able to devise better strategies for learning.

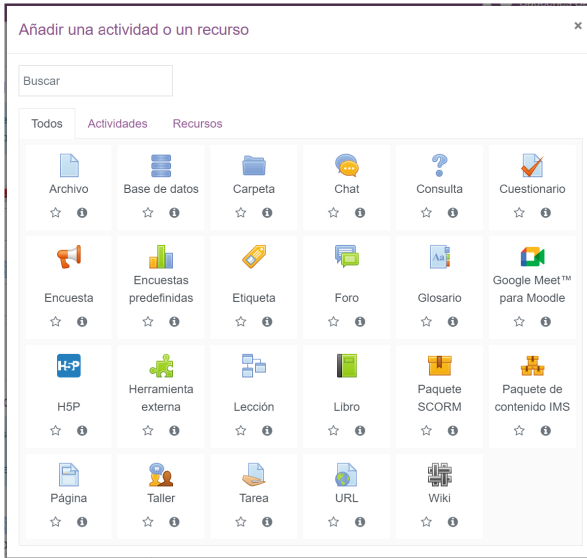


Fig. 3. Instructional team management interface

- Offer additional content: After the participant has used the course resources and these are not enough to complete the course satisfactorily, the mentor has the functionality of offering additional content, so she will have more course content that will allow her to have a better understanding of the course in the digital library.

This (see Fig. 4) allows the mentor to evaluate and measure the performance and progress of the girls in their empowerment process, through evaluation instruments, where questions are structured so that the girls reinforce what they have learned in the course lessons. In addition, the mentor will be able to view the grades of the girls' enrolled courses, in order to carry out reinforcement sessions (in cases of low grades) or award reward badges (in cases of high grades).

Girl's module. Through this module, the girl will be able to access the different courses that are enabled on the platform, also will be able to do the following:

- Develop empowerment level test: The girl must make use of the functionality of the system that allows the development of the empowerment level test. Carrying out this test allows the instructions team to know the current level of empowerment of the girl and thus offer the courses according to that level.
- Enroll in and develop empowerment courses: The girl will be able to visualize the courses she can enroll in and thus improve her empowerment level.
- Communicate with the mentor: The girl will be able to communicate with the mentor to clear her doubts or make inquiries about the topics or contents proposed by the mentor for each course.
- Use educational resources: The girl will have educational resources such as digital library, webinars, chatbot and game-based learning platform available to her to develop the courses she is enrolled in.

The screenshot displays a user profile for Laura Pérez with options for 'MENSAJE' and 'AÑADIR A CONTACTOS'. Below the profile are navigation tabs: 'Vista', 'Configuración', 'Escalas', 'Letras', 'Importar', and 'Exportar'. There are also links for 'Informe del calificador', 'Historial de calificación', 'Informe de resultados', and 'Informe general'. A 'Vista Simple' button and a 'Usuario' dropdown menu are present. The dropdown menu is currently set to 'Laura Pérez'. Below this is a table showing course progress.

Nombre del curso	Calificación
Relaciones con la familia	2,00
Las emociones emergentes	-
Generar amistades y confianza	-

Fig. 4. Mentor accessing progress interface

This (see Fig. 5) is focused on the development of activities and the learning of the educational content established by the instructional team and mentor for the girls. The activities that the girl must carry out and all the lessons that you must learn to progress in the process of female empowerment could be shown in the system. Additionally, girls, mentors, and the instructional team can look at the courses they have been enrolled in to develop or manage their educational content.

Empowerment test. The instructional team will develop a test to define the level of empowerment of the girl, through the use of an instrument that will allow measuring empowerment and knowing her level (high, medium and low).

Learning tools. EmpowerMe integrates the Chatbot (see Fig. 6A), previously configured and connected to the Moodle database, with which the girls can make additional courses and consultations that can be incorporated at the decision of the mentors. Likewise, the game-based learning platform called Kahoot (see Fig. 6B) has been incorporated through EmpowerMe's institutional email, where mentors can log into the Kahoot platform to design their empowerment educational content in a more dynamic way, generate the web link and add it as a resource in Moodle within the desired course. In addition, the Google Meet webinar tool (see Fig. 6C) allows for synchronous and asynchronous video conferencing sessions, so that both students present at the defined times and those who cannot be present can learn through the tool and their mentors. Finally, EmpowerMe includes a digital library as a tool to provide the girls with manuals, documents, presentations and other materials uploaded to the system by their mentors to complement what they have learned during the empowerment sessions.

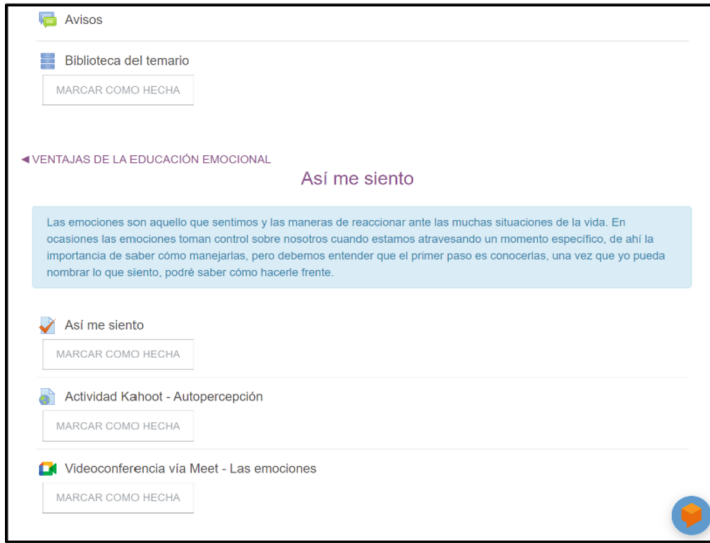


Fig. 5. Enrolled course interface

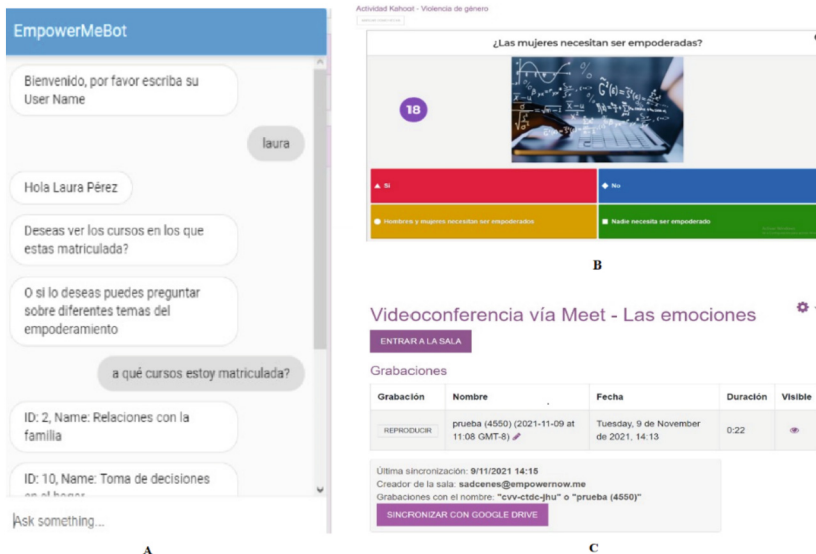


Fig. 6. EmpowerMe Tool: A) Chatbot support; B) Kahoot; C) Webinar

3.3 Architecture

The physical architecture (see Fig. 7) shows that the actors interact from their local machines via the Internet with the system services that are located in the cloud (Google Cloud) for full availability, where the two servers needed to store EmpowerMe are

hosted: applications and web. The Webinar tool, the Chatbot, the Digital Library and the game-oriented learning platform are managed through the application server administrator to integrate with the Moodle-based empowerment content manager, forming the EmpowerMe proposal. Each tool is referred to as a service because of the qualities and functions that each tool possesses to communicate with the platform and be of use to the instructional team, mentors and girls.

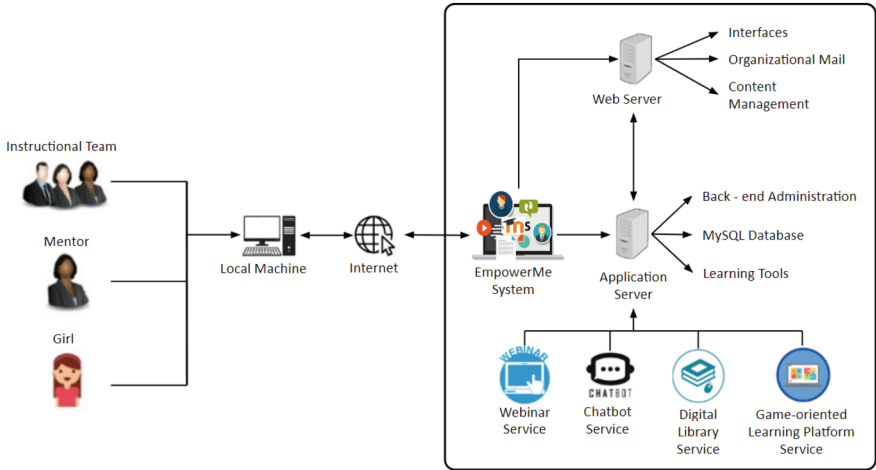


Fig. 7. EmpowerMe physical architecture

Likewise, (see Fig. 8) shows the logical architecture, which shows the components of the platform that are accessible through the local computer via the web page. This web platform is accessed through the local machines themselves and connects to the server where the functionalities of the components applied in the system are hosted to be used for each actor, which are accessible due to the interfaces and the access control managed by competent users to their respective functionalities.

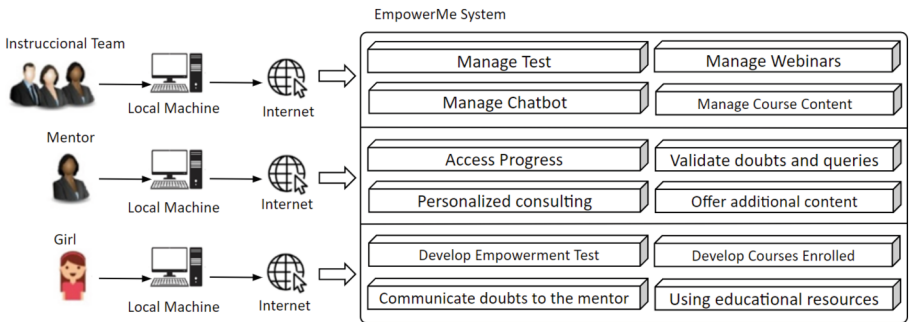


Fig. 8. EmpowerMe logical architecture

4 Case Validation

4.1 Case Study

Eight girls between the ages of thirteen and fifteen who are studying at the high school level in different schools, all of whom also study at a pre-university academy located in Huancayo, Peru, participated (see Table 1). In Peru, school studies are divided into primary (six grades) and high school (five grades). In addition, according to INEI on gender violence, it indicates that 63.2% of women between 15 and 49 years of age have experienced cases of violence produced by a partner or partner [28], empowerment being necessary from early stages of formation.

Table 1. Profiles of the participating girls.

ID	High School Grade	Age
P1	4.°	15 years
P2	1.°	13 years
P3	1.°	13 years
P4	3.°	14 years
P5	3.°	14 years
P6	1.°	13 years
P7	4.°	15 years
P8	2.°	13 years

EmpowerMe implementation. EmpowerMe was presented to the psychologist specialized in empowerment who works as a tutor in an academy. He was then trained for one hour virtually, so that he prepared the material for an empowerment course of two sessions of 1.5 h each, covering various topics such as participatory empowerment, recklessness, external influences, risk factors, etc. In addition, he prepared question and answer games through Kahoot.

Validation metrics. To evaluate the results of the case study, the Hernandez and Garcia empowerment test [27], used in several studies in Peru on empowerment in women, including [29–31], was used; it consists of thirty-four questions that encompass seven empowerment factors.

Traditional method. Nowadays, the traditional method of empowerment tends to be long talks in schools or events such as congresses where real cases of women who have achieved empowerment are presented. Under a perspective of intellectual empowerment or social recognition, women seek autonomy in general as well as to eradicate the denigrating acts and demerits that are posed by societies that are still sexist to this day. This method does not focus on girls since these talks or events are generally given from adolescence onwards.

Experiment. The eight girls were grouped into groups of four, called G1 and G2. The training was conducted in two sessions of 1.5 h each, both in one week, and at its

culmination the empowerment test was applied. Both groups will take the empowerment course in the traditional way through videoconferencing and the assistance of an empowerment specialist. In addition, the G2 group, unlike the G1 group, uses EmpowerMe, i.e. the use of tools such as Chatbot, digital library, Webinar and game-based learning platform.

Results. The results show that the initial average of empowerment of groups G1 and G2 was 99.5 points, and, at the end of the course using the traditional method (see Fig. 9A), this increased on average by two points, while using EmpowerMe (see Fig. 9B) it increased by 6.25, that is, there was an improvement with respect to the traditional method.

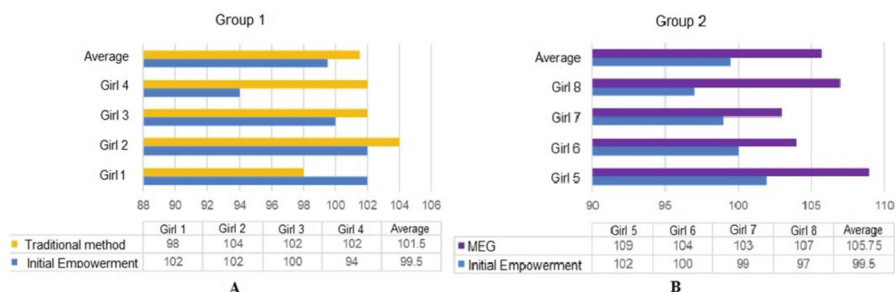


Fig. 9. Level of empowerment: A) According to the traditional method; B) Using the system

4.2 Usability and Satisfaction

Participants. Seven collegiate psychologists participated, who assumed the roles of mentor and instructional team, three of them work in schools, two in non-profit organizations, and two as independent, all of them with experience of more than six years in projects and initiatives of empowerment of children, adolescents and young people (see Table 2), also, in some technological tools for empowerment.

Table 2. Characteristics of the participating psychologists

ID	Gender	Experience in empowerment	Labor Center
P1	Female	8 years	Charity
P2	Female	7 years	Non-Governmental Organization
P3	Female	10 years	Psychologist at school
P4	Female	7 years	Independent psychologist
P5	Male	15 years	Psychologist at school
P6	Male	10 years	Psychologist at school
P7	Male	7 years	Independent psychologist

Validation instrument. A questionnaire was developed using Google Forms consisting of twenty questions divided into four sections (see Table 3): usability, content,

monitoring (empowerment progress) and satisfaction. In addition, for each question, 5 response alternatives are presented according to the Likert scale (1: Strongly disagree; 2: Disagree; 3: Neither agree nor disagree; 4: Agree; 5: Strongly agree).

Table 3. Questionnaire to evaluate EmpowerMe

Dimension	ID	Question
Usability	Q01	Do the four tools presented in EmpowerMe contribute to improving the girl's learning?
	Q02	Do the four tools presented in EmpowerMe help improve the way girls are empowered?
	Q03	Can the chatbot with frequently asked questions on various empowerment topics speed up the girl's learning?
	Q04	Does the webinar tool allow the girl to better understand the topics by listening to a specialist in empowerment courses?
	Q05	Does the game-based learning tool allow the girl to learn by playing the empowerment courses more easily?
	Q06	Can the learning management system encourage mentors to change their current way of empowering?
Content	Q07	Is the tool shown as an option to boost empowerment content across the country?
	Q08	Does the tool allow any mentor to distribute their content more easily?
	Q09	Is the tool useful to create activities and communicate with my girls?
	Q10	Does the digital library within EmpowerMe allow the girl to more easily access any empowering content you create for learning?
Follow-up	Q11	Does the tool show a faster way to track girls' progress?
	Q12	Does the webinar tool allow girls to follow up more directly on their empowerment?
	Q13	Is accessing academic information and reviewing the girl's progress in the system easy and effective?
Satisfaction	Q14	As a mentor, is the use of system functionalities understandable?
	Q15	Are the design themes and graphics used attractive with respect to the content displayed?
	Q16	Does the system allow understandable and orderly navigation?
	Q17	Does the visualization of questionnaires, together with their results, allow us to better understand the level of progress with respect to the empowerment courses?
	Q18	Does EmpowerMe allow data capture of girls in the process of empowerment?
	Q19	Does EmpowerMe help the mentor make better decisions in the empowerment process?
	Q20	Is the mentor satisfied with the empowerment system?

Experiment. A 1.5-h videoconference was held with 2 to 3 psychologists at a time to present EmpowerMe, its purpose, functionalities, and advantages. Access to the system was given and activities were carried out (course management, participant management, evaluation management, question banks for the chatbot) of the mentor and the instructional team that were repeated by the psychologists. During the presentation, questions

from the specialists were answered. At the end of the presentation, the usability and satisfaction questionnaire was applied, previously sent to their personal emails.

Results. The results of the EmpowerMe evaluation questionnaire (see Table 4) show a very high average rating (not less than 4.43 out of 5) regarding usability, content, follow-up, and satisfaction. In usability, it scored high for learning acceleration (Q03), and scored very high on the other questions, i.e. improving learning (Q01), improving empowerment (Q02), allowing the girl to better understand topics by listening to a specialist (Q04), and encourages mentors to change their current way of empowering (Q05). In content, a very high rating was obtained in all questions, i.e., it promotes empowering content (Q07), facilitates content distribution (Q08), is useful for creating activities and advising girls (Q09) and shows simplicity to access any empowering content through the digital library (Q10). In the follow-up, very high marks were obtained for each of the questions, i.e., the system (Q11) and the webinar (Q12) allow easy and effective progress monitoring (Q13). Finally, in satisfaction, a very high rating was obtained regarding the use of the system's functionalities (Q14), the graphic interfaces and design are attractive for the content displayed (Q15), the orderly and clear navigation (Q16), the agility in the visualization of questionnaires and their results (Q17), the improvement in girls' data capture (Q18), support for the mentor to make better decisions in the empowerment process (Q19) and compliance with the system (Q20).

Table 4. Results on the educational empowerment capacity of EmpowerMe and its usability

Dimension	Id	Specialists0							Average	
		E1	E2	E3	E4	E5	E6	E7		
Usability	Q01	5	5	4	5	3	5	5	4.57	4.50
	Q02	4	5	4	5	3	5	5	4.43	
	Q03	5	4	4	4	2	5	5	4.14	
	Q04	5	5	4	5	3	5	5	4.57	
	Q05	5	5	4	5	4	5	5	4.71	
	Q06	5	4	4	5	4	5	5	4.57	
Content	Q07	4	5	4	5	3	5	5	4.43	4.57
	Q08	5	5	4	5	3	5	5	4.57	
	Q09	5	4	5	5	3	5	5	4.57	
	Q10	5	5	5	5	3	5	5	4.71	
Follow-up	Q11	5	4	5	5	2	5	5	4.43	4.43
	Q12	5	4	5	5	2	4	5	4.29	
	Q13	5	5	5	5	2	5	5	4.57	
Satisfaction	Q14	5	5	4	5	5	5	4	4.71	4.73
	Q15	4	4	5	5	4	4	4	4.29	
	Q16	5	5	5	5	5	5	4	4.86	
	Q17	5	5	5	5	4	5	5	4.86	
	Q18	5	5	5	5	4	5	5	4.86	
	Q19	5	5	5	5	4	5	5	4.86	
	Q20	5	5	4	5	4	5	5	4.71	

5 Conclusions

MEG (Model for Empowerment in Girls), an IT e-learning model has been designed to assist in the empowerment process for girls in high school education, which includes five modules (instructional team, tools, empowerment test, mentor and girl) and three roles (instructional team, mentor and girl). MEG was implemented as a system called EmpowerMe, which is based on the Moodle LMS and integrates digital library, chatbot, webinar and game-based learning platforms. The results of the case study with eight girls point out that the empowerment process using EmpowerMe improves, significantly, the level of empowerment with respect to traditional teaching, showing after two class sessions an average score 105.75 points on a Hernandez and Garcia [27] scale of 135, four points higher than the average of traditional teaching. On the other hand, the results of the usability, content, follow-up and satisfaction survey applied to 7 psychologists with experience in female empowerment show a very high rating, with an average rating of no less than 4.4 out of 5. These results are limited to the perception of the respondents. As future work we intend to develop an adaptive version of EmpowerMe according to the level of empowerment, this because several studies show that adaptability makes students learn effectively [32].

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