

Learning System for the Empowerment of High School Girls Students

Sistema de aprendizaje para el empoderamiento de niñas estudiantes de secundaria

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Abstract. Currently, in the world there is a gender gap between men and women, this is manifested in gender-based violence and social injustice. An alternative to reduce this gap is the empowerment of women and girls through learning content that gives them leadership and independence, knowing their rights, and preventing acts of violence. There are few technological tools that support female empowerment, these are generally aimed at adult women. This study proposes an IT model for the empowerment of girls in high school education, and an EmpowerMe system, which implements the proposed model, using Moodle, digital library, chatbot, webinar and a game-based learning platform. EmpowerMe was validated through a case study and expert judgment. The results show that there was a learning improvement of 4 points. In addition, the usability, content, follow-up, and satisfaction survey show an average rating of 4.4 out of 5.

Keywords: Female empowerment, Webinar, Chatbot, Moodle, Learning games.

Resumen. En el mundo existe una brecha de género entre hombres y mujeres, esto se manifiesta en violencia de género e injusticia social. Una alternativa para reducir esta brecha es el empoderamiento de las mujeres mediante el aprendizaje de contenido que les otorgue liderazgo e independencia, conocer sus derechos, y prevenir actos de violencia. Existen pocas herramientas tecnológicas que apoyan al empoderamiento femenino, estas en general están dirigidas a mujeres adultas. Este estudio propone un modelo de TI para el empoderamiento de niñas en educación secundaria, y un sistema EmpowerMe, que implementa el modelo propuesto, usando Moodle, biblioteca digital, chatbot, webinar y una plataforma de aprendizaje basado en juegos. EmpowerMe fue validado mediante un caso de estudio y un juicio de expertos. Los resultados muestran que hubo una mejora de aprendizaje de 4 puntos. Además, la encuesta de usabilidad, contenido, seguimiento y satisfacción muestran una calificación promedio de 4.4 sobre 5.

Palabras clave: Empoderamiento femenino, Webinar, Chatbot, Moodle, Learning games.

Paper Type: Research Paper.

1 Introduction

Worldwide, there is a gender gap between men and women, being 70% in European countries and 50% in American countries (World Economic Forum, 2020), and that is manifested in gender violence and social injustice. One in three women has experienced violence by a family member or spouse (García, 2020), 69% of human trafficking are women and 5% of these are girls (UNODC, 2021), and, during the COVID-19 pandemic, 243 million cases of physical or sexual violence against women and girls by members of their family were recorded (UNWOMEN, 2020). On the other hand, the incorporation of women into the labor market is affected by marriage and motherhood, events that reduce their activity rates and, therefore, their income and labor benefits (UNWOMEN, 2019). In addition, according to the United Nations Population Fund, women of reproductive age have poor access to health services, which is linked to other forms of inequality and constitutes a threat to the Sustainable Development Goals (UNFPA, 2017).

An alternative to reduce the gender gap is the empowerment of women and girls through learning content that gives them leadership and independence, that allows them 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 (Meza et al., 2018), the construction of individual capacities regarding empowerment (Eger et al., 2018), pedagogical strategies such as Right To Play to educate children with problems of violence (Karmaliani et al., 2020), self-help models for collaborative learning in different cultures (O'Connor et al., 2020), social education for disabled women (Rajni, 2020), the prevention of abuse towards young women and older adults (Estebansari et al., 2018), the educational framework for the empowerment of women in rural India (Otelsberg et al., 2013; Sheshadri et al., 2023), and the study by (Cabrera & Mauricio, 2017) that indicates that education contributes to female entrepreneurship.

Two important aspects in the empowerment of women: educational models and technological tools. Educational models address empowerment from an educational perspective, focusing on high school education. An example is the STEM model, which improves female empowerment through training in complex topics that are male-preferred (Tam et al., 2020). On the other hand, technological tools help improve skills, knowledge, and participation in media and social networks (del Prete et al., 2013). An example is the PRISMA tool, which provides an innovative and attractive way to access female empowerment content focused on learning and to access health content (Mackey & Petrucka, 2021), and another is social networks, widely used throughout the world, worldwide, which serve to identify patterns in behavior, highlight differences in education and leadership, and distribute content on female empowerment (Shockley et al., 2020). However, the various empowerment tools are not focused on girls and adolescents in the high school education stage, since, according to UNICEF, in 2015, a considerable percentage of the population are children and adolescents of school age in several developing countries (Castillero, 2017; UNICEF, 2015).

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

This work is organized into six sections. In section 2, the state of the art on learning applications that contribute to the empowerment of women is presented. The technological proposal model and its implementation are described in section 3 and 4, respectively. Section 5 describes the validation process. Finally, section 6 shows the conclusions of the study.

2 Learning systems for female empowerment

Learning systems 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 (Vidal Ledo et al., 2014). In the case of female empowerment, 11 learning systems have been identified, in general, these consider technological tools such as Facebook and Twitter social networks for data collection against community problems of society (Shockley et al., 2020). However, few studies are aimed at attending to the age group of school-age girls (see Table 1).

2.1 Defining the scope and planning of the review

This study proposes a taxonomy established for literature reviews presented by (Cooper, 1988) in which the objective, the organization of the information, perspective assumed, audience, and coverage of the review are defined. Common conceptual aspects based on guiding questions were considered to organize information, focusing on theories and case studies. This review's target audience is general and academics with interest in the topic of OGD, as shown in Table 1.

Table 1. Learning systems for female empowerment

| No. | Learning system | Description | Author |
|-----|-----------------|---|--------------|
| 1 | Wileurope | Blogs for professionals that allow the exchange of ideas and the development of best practices. It includes the | (ENWL, 2021) |

| No. | Learning system | Description | Author |
|-----|----------------------------|---|-------------------------------|
| | | Talent Pool Program and Empowering Girls training programs. | |
| 2 | TheWieSuite | Blogs to share experiences of success and support among women. Includes forums and mentor and student programs. | (TheWieSuite, 2023) |
| 3 | HeForShe | Blogs that seek solidarity for gender equality and include impact reports. | (UNWOMEN, 2019) |
| 4 | SheLeader | System to empower women both professionally, personally, and collectively, and is based on a blog and a digital library that includes videos, documents, forms, among others. Includes audiovisual capsules, tips and good practices. | (SheLeader, 2021) |
| 5 | Black Girl in OM | System to promote the integral well-being and inner beauty of African-American women. It contemplates podcasts, blogs, video conferences and forums, where meditations and appreciations are shared among African-American women. | (Black Girl In OM, 2023) |
| 6 | EmpowerWomen | System to improve the exchange of experiences and good practices regarding the financial empowerment of women. It includes a digital library that includes videos and documents. | (EmpowerWomen, 2022) |
| 7 | Facebook and Twitter | Systems that the authors use to identify patterns in behavior and thus empower women. The system is based on a social network that contemplates empowering content and interaction with the user. | (Shockley et al., 2020) |
| 8 | Instagram | System that the authors use to disseminate educational content to maintain good health in women. The system is based on social networks that considers publications and photos with educational and healthy content. | (Camacho-Miñano et al., 2019) |
| 9 | e-Learning | Online learning system that uses digital storytelling to educate about stories and experiences aimed at female communities with a high macho influence. | (Rouhani, 2019) |
| 10 | Financial digital services | Learning and advisory system for basic and necessary financial education in societies with restrictions for women and includes blogs and forums. | (Hendriks, 2019) |
| 12 | Pap Test | System that disseminates improved and timely information on causes, possible results and treatments to women recently diagnosed with abnormal Pap test results, with which it is intended to empower women. | (Reychav et al., 2018) |

3 MEG model

MEG (Model for Empowerment in Girls) is proposed, an IT model to help high school education girls in the empowerment process, which includes 6 modules (administrator, instructional team, tools, empowerment test, mentor, and girl) and 4 roles (administrator, instructional team, mentor, and girl) (see Figure 1).

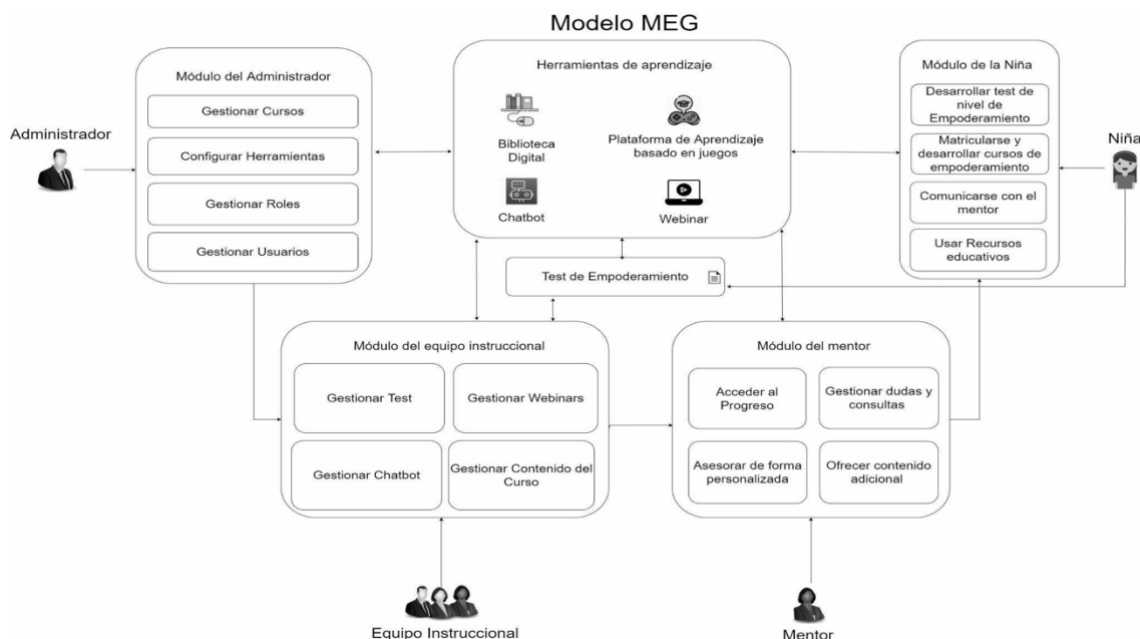


Figure 1. MEG model to help high school education girls in the empowerment process.

First, the Administrator manages the roles, courses, and users, and then configures the tools so that the platform is ready for the other users. Secondly, the Instructional Team manages the test, chatbot, webinars and course content so that the girl and the tutor can use the platform. Thirdly, the girl completes 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. Fourth, the Mentor accesses the girl's progress to validate doubts and queries, as well as to generate personalized advice and offer additional content, if necessary.

3.1 Administrator module

Through this module, the administrator will be able to manage the following:

- Manage courses: Create/update/delete courses (title, period, organization, content), also categorize content into topics, sub-topics.
- 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: Administrators configure the functionalities and permissions for each role (girl, instructional team, and mentor), allowing each role access to the ideal routes.
- Manage users: Administrators will be able to manage users (register, update and withdraw) and assign the corresponding role, in addition, they will be able to support users while they remain within the system.

3.2 Instructional Team Module

Through this module, the instructional team will be able to manage the following:

- Manage test: Supervise the application of the empowerment test and suggest courses to increase and reinforce skills.
- Manage webinars: Develop virtual sessions on topics and courses in the Google Meet webinar tool.

- Manage chatbot: Plan the most appropriate questions and answers for the chatbot, so that the girl can solve her doubts about the course content.
- Manage course content: Develop empowering content, assessment, and development activities for girls.

3.3 Mentor Module

Through this module, the mentor will be able to manage the following:

- Access to progress: Visualize in real time the progress of the girl in her enrolled courses.
- Manage doubts and queries: through the chatbot and e-mail you can answer questions and queries about the course.
- Advise in a personalized way: To communicate advice and strategies that allow the girl to successfully complete her enrolled courses.
- Offer additional content: The girl will have more content of the course that allows her to have a better understanding of it.

3.4 Girl Module

Through this module, the girl will be able to do the following:

- Develop empowerment level test: To know your current level of empowerment and, in this way, take the courses according to that level.
- Enroll and develop empowerment courses: The girl will be able to view the courses in which she can enroll and thus improve her level of empowerment.
- Communicate with the mentor: The girl will be able to communicate with the mentor to clear up her doubts or ask questions about the topics or contents proposed by the mentor for each course.
- Use educational resources: The girl will have at her disposal educational resources such as a digital library, webinars, chatbot and game-based learning platform to develop the courses in which she is enrolled.

3.5 Empowerment Test

The instructional team will develop a test to define the girl's level of empowerment, through the use of an instrument that will measure empowerment and determine its level (high, medium and low). Some tests to measure empowerment are "Measuring Women's Empowerment: An Assessment of the Gender-Related Development Index and the Gender Empowerment Measure" (Charmes & Wieringa, 2003), "Scale to measure personal agency and empowerment" (Pick et al., 2007), "Instrument to measure the empowerment of women" (Hernandez Sanchez & García Falconi, 2008), and "Factors of empowerment and protection of women against violence" (Casique, 2010).

3.6 Learning Tools Module

They are the materials, resources, and activities necessary to promote and facilitate the learning of a certain topic. The following technological tools have been considered due to their great utility in the learning process:

- Chatbot: Computer program that recreates or simulates human conversations, which can be spoken or written, through which humans can communicate with technological devices as if they were another person (ORACLE, 2022). In this way, this tool can help clarify the doubts of the girl after reading about a complex topic, making the existence of a mentor 24 hours a day not essential. Natural language understanding platforms to develop chatbots are Dialogflow (Google Cloud, 2022), Amazon Lex (Amazon Web Services, 2022), IBM Watson (IBM, 2022), among others.

- Webinar: It consists of transferring informative content to a recorded or live video format, to later distribute it through the Internet (InBoundCycle, 2021). In this way, the girl accesses synchronous and asynchronous sessions developed by professionals. Some of these technologies are Google Meet (Google Workspace, 2022), Microsoft Teams (Microsoft, 2022), Zoom (Zoom, 2022), Jitsi (Jitsi Meet, 2022), among others.
- Digital library: It consists of the virtual representation of a library, which allows girls to collect, filter, and search for files, books, audios, videos, etc (On Aliat, 2021). There is a diversity of platforms for the development of virtual libraries such as OAPEN (OAPEN, 2022), KOHA (KOHA, 2022), BiblioteQ (UpToDown, 2022).
- Educational platform: It is an integrated set of interactive services that provides teachers, students and parents with information, tools and educational resources to support the teaching-learning process. Some educational platforms are Moodle (Moodle, 2022), Classroom (Google for education, 2022), Microsoft Teams (Microsoft, 2022), Canvas (UTP, 2022), Blackboard (Blackboard Collaborate, 2022).
- Game-based learning platform: Game-based learning is constituted by the implementation of games in the field of education, through which it is possible to increase the concentration, effort and performance of girls (Cobos et al., 2018). In addition, these types of tools are increasingly used when education is transmitted in digital environments, some of them are Kahoot (Kahoot, 2022), EdApp (EdApp, 2022), Quizizz (Quizizz, 2022), and Gametize (Gametize, 2022).

4 Implementation

The following describes the EmpowerMe system (acronyms from Empower and Me) that implements the MEG model to support the empowerment process of high school girls. EmpowerMe has been built on top of the LMS Moodle, because it has features that allow easy integration with other technology tools, its adaptability thanks to its open-source code, the availability of different resources for a set of contents, etc.

4.1 Architecture

The physical architecture (see Figure 2) shows that the stakeholders interact through the Internet with the system services that are in the cloud (Google Cloud), where the application and web servers are hosted. The Webinar tool, Chatbot, Digital Library and Game-oriented learning platform are managed to integrate with the Moodle empowerment content management system, forming the EmpowerMe proposal.

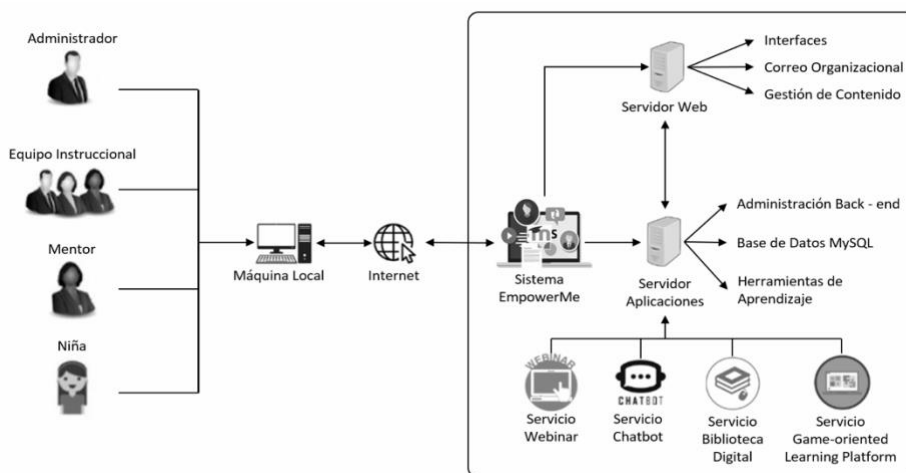


Figure 2. Physical architecture of EmpowerMe.

Likewise, Figure 3 shows the logical architecture, which shows the components of the platform that are accessible through the local computer through the web page. This web platform connects to the server

where the services of the learning tools are hosted, which are accessible thanks to the interfaces and access control managed by competent users to their respective functionalities.

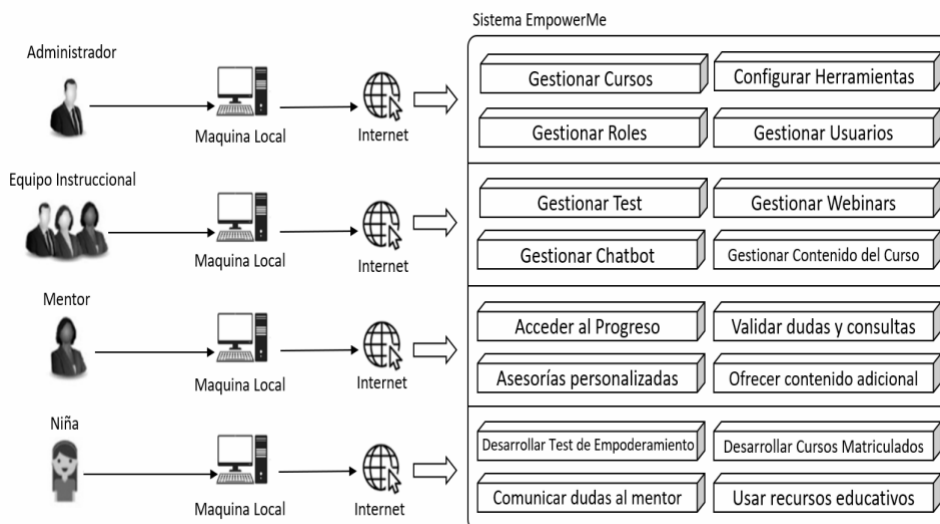


Figure 3. Logical architecture of the proposal.

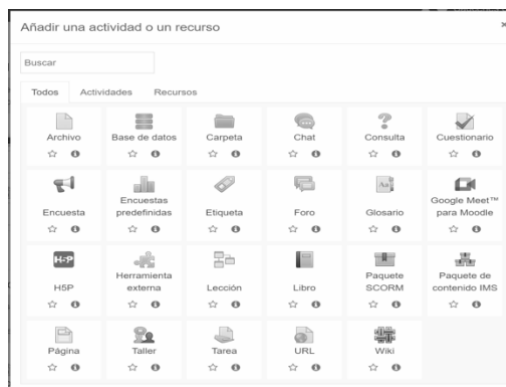
4.2 Modules

The EmpowerMe application has the Moodle LMS as its base platform, this is because it is a flexible, open-source platform that facilitates integration with tools, and has a lot of documentation. EmpowerMe has four modules: “Administrative”, “Educational Content”, “Evaluation and Monitoring” and “Course Development”, which are explained below.

Administrative management. This component 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. Figure 4 shows two functionalities of this component.



a)



b)

Figure 4. Administrative management interface: a) Manage courses; b) Configure tools.

Educational content management. This module 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. As seen in Figure 4, 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.

Evaluation and monitoring management. This module 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, to carry out reinforcement sessions (in cases of low grades) or award reward badges (in cases of high grades). Figure 5 shows two functionalities of this component.

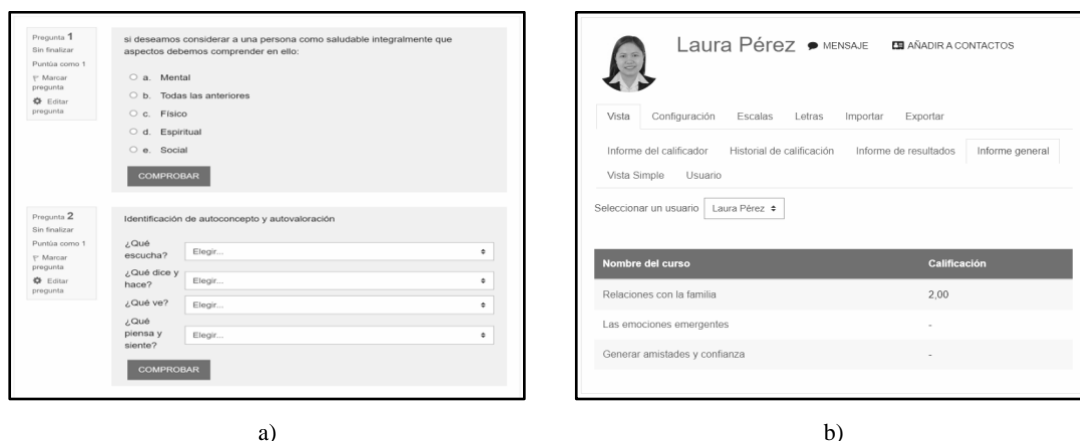


Figure 5. Educational content management interface: a) Manage evaluation; b) User monitoring.

Course Development Management. This module is focused on the development of activities and the learning of the educational content established by the instructional team for the girls. Figure 6a shows the activities that you must carry out and all the lessons that you must learn to progress in the process of female empowerment. Additionally, girls, mentors, and the instructional team can look at the courses they have been enrolled in to develop or manage their educational content, as shown in Figure 6b.

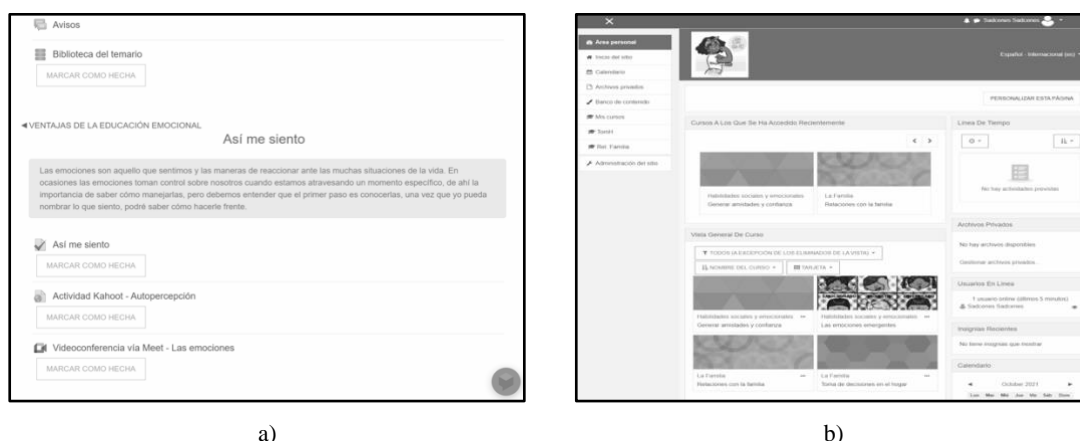


Figure 6. Course development management interface: a) Enrolled course; b) Presentation of registered courses.

Learning tools. EmpowerMe integrates the Chatbot (see Figure 7a), previously configured and connected to the Moodle database, with which the girls can take courses (enrolled, not enrolled) and make additional queries that can be incorporated at the decision of the mentors. The integration of the chatbot with Moodle is initially carried out with the communication between Dialogflow and the database accessed by phpMyAdmin, for which an identifier is generated within the chatbot that is recognizable by the user

and allows the necessary queries to be generated. Subsequently, the permissions are enabled within the application server so that both systems communicate without restrictions and the web resource blocks within the LMS are used to add the presentation code so that the chatbot is displayed on all pages of the EmpowerMe system. Likewise, the Kahoot game (see Figure 7b) has been incorporated through the EmpowerMe institutional email, where the mentors enter the Kahoot platform to design their empowerment educational content, generate their Kahoot link and add it as an online resource. moodle within the desired course. In addition, it allows the mentor to visualize the ranking of correct and incorrect answers that were obtained in a certain period of time and measure the level of empowerment through the answer report. Finally, the Google Meet Webinar tool (see Figure 7c) allows video conferencing sessions to be held synchronously (the girls are notified to join and listen to the reinforcement advice and detailed explanation) and asynchronously (they will be able to view the recording of the same). at the time they want, managing to make their queries through the Chatbot and by e-mail). The integration of Google Meet with Moodle was achieved through the LMS's own extensions with Google Workspace resources, allowing mentors to select Google Meet videoconferences from the same system and publish them in the course, so that girls can access them. Finally, EmpowerMe includes the Digital Library that provides girls with manuals, presentations, documents and activities to complement what they have learned.

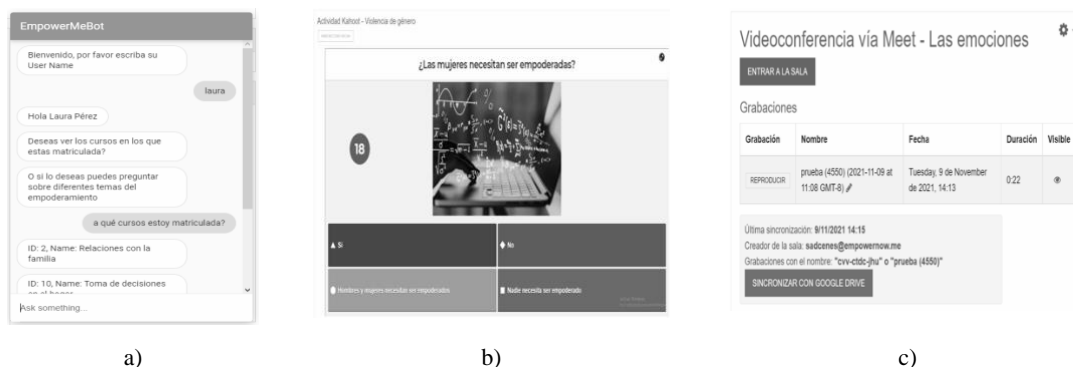


Figure 7. EmpowerMe tool: a) Chatbot support; b) Kahoot; c) Webinar.

5 Validation

The effectiveness of EmpowerMe with respect to female empowerment is evaluated through a case study with 8 girls, and the usability and satisfaction will be evaluated through expert surveys, in Lima, Peru.

5.1 Case study

Girls. 8 girls between 13 and 15 years old who are studying at the secondary level in different schools (Table 2) participated, all of them also study in a pre-university academy, located in Huancayo, Peru. In Peru, school studies are divided into primary (6 grades) and secondary (5 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, empowerment being necessary from early stages of training.

Table 2. Profiles of the participating girls.

| ID | High School Grade | Age |
|----|-------------------|----------|
| P1 | 4.º | 15 years |
| P2 | 1.º | 13 years |
| P3 | 1.º | 13 years |
| P4 | 3.º | 14 years |
| P5 | 3.º | 14 years |

| | | |
|----|-----|----------|
| P6 | 1.º | 13 years |
| P7 | 4.º | 15 years |

EmpowerMe Implementation. EmpowerMe was introduced to a psychologist specializing in empowerment who works as a tutor in an academy, who, knowing the functionalities and benefits of the application, agreed to participate and involve his students in the tests. Next, he was trained for 1 hour virtually, receiving access credentials as a mentor and instructional team, so that he prepared the material for an empowerment course of 2 sessions of 1.5 hours each, covering various topics such as participatory empowerment, recklessness, external influences, risk factors, Johari window, empowered woman, improving my empowerment, independence, equality and security, social satisfaction, SWOT, and Greta Thumberg's testimony. Also, he prepared trivia games through Kahoot. The specialist contacted the parents of the 8 girls participating in the experiment, who expressed their agreement.

Validation Metric. To evaluate the results of the case study, the Hernandez Sanchez & García Falconi (2008) empowerment test was used, used in several studies in Peru on women's empowerment, including (Durand et al., 2015; Navas Gómez et al., 2021; Rojas & Vilca, 2021; Sandoval, 2021); consisting of 34 questions that encompass 7 empowerment factors (participatory empowerment, Recklessness, External influences, Independence, Equality, Social satisfaction and Security). In addition, for each question, 4 response alternatives are presented according to the Likert scale (1: Total disagreement; 2: Disagreement; 3: Agreement; 4: Total agreement); This questionnaire must be solved by the girls once the empowerment course is finished.

Experiment. The 8 girls were grouped into groups of 4, denoted by G1 and G2. The training was carried out in 2 sessions of 1.5 hours each, both in one week, and at its completion the empowerment test was applied. Both groups will take the empowerment course in the traditional way through videoconference and the assistance of an empowerment specialist. In addition, the G2 group, unlike the G1 group, uses EmpowerMe, that is, 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 Figure 8a), it increased on average by 2 points, while using of EmpowerMe (see Figure 8b) it increased by 6.25, that is, there was a considerable improvement over the traditional method.

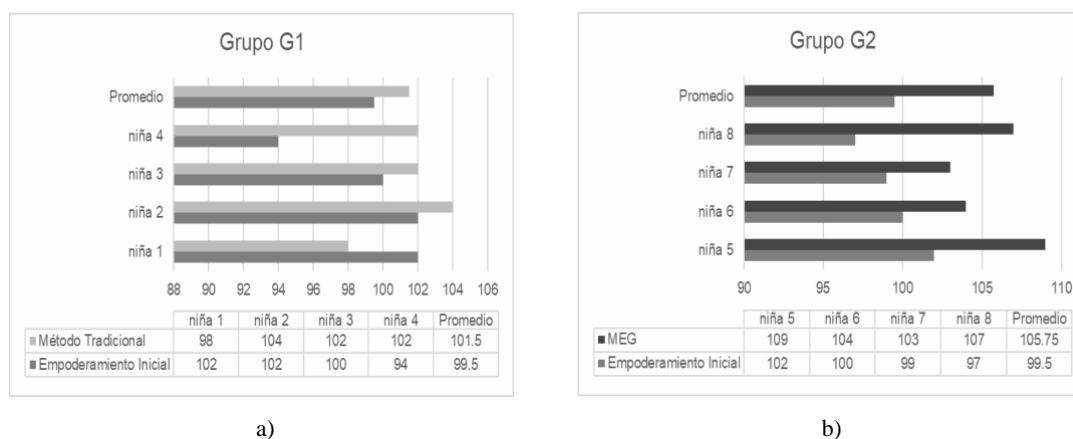


Figure 8. Empowerment level: a) According to the traditional method; b) Using the system.

5.2 Usability and satisfaction

Participants. 7 collegiate psychologists participated, who assumed the roles of mentor and instructional team, 3 of them work in schools, 2 in non-profit organizations, and 2 as independent, all of them with experience of more than 6 years in projects and initiatives of empowerment of children, adolescents and young people (see Table 3), also, in some technological tools for empowerment.

Table 3. Characteristics of the participating psychologists

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

Validation instrument. A questionnaire was developed using Google Forms consisting of 20 questions divided into 4 sections (see Table 4): 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 4. Questionnaire to evaluate EmpowerMe.

| Dimension | ID | Questions |
|--------------|-----|---|
| 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 | Could 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 | Could the learning management system encourage mentors to change their current way of empowering? |
| Contents | 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? |
| Tracing | Q11 | Does the tool show a faster way to track girls' progress? |
| | Q12 | Does the webinar tool allow for more direct follow-up with girls about 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-hour video conference was held with 2 to 3 psychologists at a time for the presentation of 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 were applied, previously sent to their personal emails.

Results. The results of the EmpowerMe evaluation questionnaire (Table 5) 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 5. Results on the educational empowerment capacity of EmpowerMe and its usability.

| Dimension | ID | Specialists | | | | | | | 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 | |
| Contents | 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 | |
| Tracing | 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 | |

6 Conclusions

MEG (Model for Empowerment in Girls) has been designed, an IT model to help high school education girls in the empowerment process, which includes 6 modules (administrator, instructional team, tools, empowerment test, mentor, and girl) and 4 roles (administrator, instructional team, mentor and girl). MEG was implemented as a system called EmpowerMe, which is based on the Moodle learning management system and integrates a digital library, chatbot, webinar and game-based learning platforms. Unlike other empowerment systems such as Wileurope, TheWieSuite, HeForShe, SheLeader, EmpowerMe integrates more tools and contemplates various content formats, better supporting the female empowerment process.

The results of the case study with 8 girls indicate that the empowerment process using EmpowerMe significantly improves the level of empowerment compared to traditional teaching, showing an average score of 105.75 points on a scale of 135 after 2 class sessions. de Hernandez Sanchez & García Falconi (2008), 4 points higher than the average for 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 participants.

Various studies show that thematic training and technological tools contribute to women's empowerment, as indicated by Tam et al. (2020) and Del Prete et al. (2013) respectively. Therefore, the proposed model (MEG) and its implementation (EmpowerME) represent an alternative for girls'

empowerment. Furthermore, the results of the case study demonstrate a 100% improvement (6.25 points) in learning compared to the traditional method (2 points). On the other hand, the results of the usability, content, monitoring, and satisfaction survey show very high ratings from specialists (teachers). Additionally, the underlying platform of the system is open-source software, meaning it has very low cost. As a result, the proposal could be replicated in other schools and/or regions, which would have a positive impact on women's empowerment.

As future work, it is intended to develop an adaptive version of EmpowerMe according to the level of empowerment, this because various studies show that adaptability makes students learn effectively (Fierro & Mauricio, 2022).

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