



## Evaluation of the Voltaic Arc Welding Training at Codesa, Esmeraldas: Diagnosis and Recommendations

Evaluación de la Capacitación en Soldadura por Arco Voltaico en Codesa, Esmeraldas:  
Diagnóstico y Recomendaciones

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### Abstract

The scientific article "Evaluation of the Training in Voltaic Arc Welding in Codesa, Esmeraldas Youth House: Diagnosis and Recommendations", conducted by the Mechanical Engineering career of the Technical University Luis Vargas Torres of Esmeraldas, analyzes the impact of the activities of linkage with society in the technical training of young people and local entrepreneurs. The methodology used was quantitative and non-experimental, based on surveys and direct observation using the Likert scale tool to evaluate the level of acceptance of the training, which was carried out during four practical days. Indicators such as participant satisfaction, effectiveness of the methodology, application of knowledge and

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impact on working conditions were evaluated. The data were analyzed using descriptive statistics, making it possible to identify knowledge gaps and areas for improvement. The conclusions reveal a high level of satisfaction among participants, especially in terms of organization, classroom conditions and instructors' attention. However, challenges related to course duration and the inclusion of vulnerable groups, such as women and the elderly, were identified. The study recommends adjusting schedules, expanding coverage and encouraging greater diversity in participation. Overall, the trainings proved to be an effective tool for community development, highlighting the importance of continuing to strengthen these initiatives in collaboration with educational institutions and local organizations.

**Key words:** Training, Insertion, Development, Education, Linkages.

### Resumen

El artículo científico "Evaluación de la Capacitación en Soldadura por Arco Voltaico en Codesa, Esmeraldas: Diagnóstico y Recomendaciones", realizado por la carrera de Ingeniería Mecánica de la Universidad Técnica "Luis Vargas Torres" de Esmeraldas, analiza el impacto de las actividades de vinculación con la sociedad en la formación técnica de jóvenes y emprendedores locales. La metodología empleada fue de tipo cuantitativo no experimental, basada en encuestas y observación directa empleando la herramienta escala de Likert para evaluar el nivel de aceptación de la capacitación; que se ejecutó durante cuatro jornadas prácticas. Se evaluaron indicadores como la satisfacción de los participantes, la efectividad de la metodología, la aplicación de conocimientos y el impacto en las condiciones laborales. Los datos se analizaron mediante estadística descriptiva, permitiendo identificar brechas de conocimiento y áreas de mejora. Las conclusiones revelan un alto nivel de satisfacción entre los participantes, especialmente en cuanto a la organización, las condiciones del aula y la atención de los instructores. Sin embargo, se identificaron desafíos relacionados con la duración del curso y la inclusión de grupos vulnerables, como mujeres y personas de mayor

edad. El estudio recomienda ajustar los horarios, ampliar la cobertura y fomentar una mayor diversidad en la participación. En general, las capacitaciones demostraron ser una herramienta efectiva para el desarrollo comunitario, destacando la importancia de continuar fortaleciendo estas iniciativas en colaboración con instituciones educativas y organizaciones locales.

**Palabras clave:** Capacitación, Inserción, Desarrollo, Educación, Vinculación.

## Introduction

According to Carrasco (2025), access to decent employment represents a significant challenge for young people in Ecuador, reflecting structural deficiencies in guaranteeing the right to work and youth employability. According to data from the Ministry of Labor and the National Institute of Statistics and Census, a high percentage of young people, particularly those between the ages of 18 and 29, face precarious working conditions or underemployment. This situation limits their socioeconomic inclusion and affects their personal development (p. 2). In the context of Codesa in Esmeraldas, the Youth Center seeks to generate opportunities that contribute to improving the labor market insertion of young people, promoting alternatives for their growth and well-being.

The Codesa neighborhood is located in the city of Esmeraldas, on the northern coast of Ecuador. It is an area of great urban dynamism, characterized by its cultural diversity and proximity to strategic points in the city. Codesa is located in a residential and commercial sector, with access to basic services and main roads that connect it to the center of Esmeraldas and other important areas. Its community is made up of working families and young people in search of development opportunities, making it a key space for social and educational initiatives.

The Casa de la Juventud, located in the Codesa sector of Esmeraldas, belonging to the urban parish of 5 de Agosto, is a space dedicated to the training and development of young people in the community. It offers a wide range of free courses and workshops in areas such as hairdressing, barbering, cell phone repair, first aid, entrepreneurship, and more, with the aim of providing tools that facilitate job placement

and personal growth for participants. In addition, it promotes recreational and sports activities, fostering the integration and well-being of Esmeraldas' youth. Currently, the Youth Center is directed by Darío Robinzon Ribera, who, in coordination with Mayor Vicko Villacís Tenorio, works to make the dreams of young people in Esmeraldas come true.

The Youth Center in Codesa, Esmeraldas, has become a key space for the development of technical skills in young people, offering training in welding that promotes their entry into the labor market and strengthens their capabilities. These initiatives are in line with the provisions of Ecuador's Organic Law on Youth (2010), specifically Article 9, which guarantees young people's right to participate in programs that seek their development and well-being. In this way, full youth participation is encouraged, allowing young people not only to benefit from these opportunities, but also to contribute to the design and evaluation of policies that positively impact their community.

According to Robinzon (2025), coordinator of the Esmeraldas Youth Center, this year, in coordination with the mayor's office, more than 3,000 young people were trained through activities that connected them with society. The Luis Vargas Torres Technical University played a key role in this process, especially through its mechanical engineering program. Training in electric welding was particularly important, as it improved the skills of young people over the age of 15 from more than 60 neighborhoods in the city of Esmeraldas.

According to the Decentralized Autonomous Government of Esmeraldas (2023), "the city, located on the northern coast of Ecuador, is distinguished by its natural, cultural, and ethnic diversity, but faces challenges that limit its socioeconomic development and affect the well-being of its inhabitants" (p. 105). In this sense, the youth center focused on cultural diversity serves young people who are looking for a way to obtain job skills.

According to Vera & Cuenca (2024), in Ecuador, the diversity of established enterprises has arisen from the need to generate income, as a result of an economy that lacks job opportunities. Informality and a lack of knowledge about entrepreneurship are emerging as the main causes that have given rise to most of these ventures. However, their implementation has contributed to the economic and social development of Ecuadorian families, as evidenced in Esmeraldas,

specifically in Codesa, which belongs to the urban sector of Esmeraldas. In this context, residents seek to earn their daily livelihood by acquiring skills in electric welding.

According to Bergamasco (2024), training in electric arc welding is one of the most common fusion processes for joining metals. This method involves the application of intense heat, which causes the metal at the joint between the two parts to melt and mix directly, or more frequently, with an intermediate molten filler metal. In Codesa, the development of these skills would offer the opportunity to carry out metal constructions in the field of locksmithing, as well as repairs in domestic installations. In addition, it would allow for the welding of equipment such as agricultural machinery, which is widely used in the locality.

The Luis Vargas Torres University of Esmeraldas, in full harmony with the principles promoted by UNESCO, addresses this issue rigorously, highlighting the importance of the "social responsibility" of higher education institutions and, especially, the concept of "social relevance of education." It stresses the need for society to participate more actively in university work, while recognizing that universities have a greater responsibility to the society they serve. This implies a mutual commitment, where the university and the community support and collaborate with each other to achieve an education that is truly relevant and beneficial to all involved (Villavicencio et al., 2014, p. 89).

The Continuing Education and Technical Assistance project, led by the Mechanical Engineering program, has as its main objective the promotion of socioeconomic development in the province of Esmeraldas. This project focuses on providing training and technical support in fundamental areas covering social, technological, and environmental aspects, with the aim of promoting the comprehensive progress of the Esmeraldas community. The Luis Vargas Torres Technical University, in its commitment to regional progress, has conceived this initiative as a significant contribution to enhancing the skills and knowledge of the province's inhabitants. Through this community outreach project, the aim is to stimulate active and positive participation in society, guiding the community towards a horizon of growth and comprehensive improvement (community outreach project of the Luis Vargas Torres University of Esmeraldas).

To identify needs and gaps in knowledge related to arc welding, information can be effectively collected using quantitative methods, such as surveys, which allow for accurate measurement of participants' knowledge and skill levels. According to Sarmiento-Martínez (2022), "through quantitative analysis, it is possible to segment and analyze in detail the different levels of learning and skills acquired during the training process." This approach facilitates a deeper understanding of the areas that require attention and improvement, which, in turn, contributes to the design of more specific and effective training strategies.

The main purpose of this article is to carry out a detailed analysis of the social impact indicators used to evaluate the arc welding training activities at the Codesa Youth Center, aimed at the community. These training sessions included four practical workshops, in which a tangible demonstration was given of how voltage is applied to the workpiece and the 6011 welding electrode to generate an arc between the two elements. According to Yuquilema (2023), the results obtained in this study will make it possible to determine the relevance and social significance of the training developed through community outreach projects, demonstrating their positive impact on the lives of the beneficiaries and on the social environment in general.

## Methodology

This study follows a non-experimental quantitative research design, carried out in a field setting through direct observation. It is classified as exploratory, as it examines a scenario in its natural state without intervention or manipulation of variables. The study focused on evaluating the impact of arc welding training in the province of Esmeraldas, specifically in Codesa, and how the outreach program contributes to improving the working conditions of local entrepreneurs. Both the level and type of training were analyzed within the context of a social outreach project (Garofalo et al., 2022).

The methodological approach is based on deductive reasoning. Initially, it starts from the contextualization of the current situation in terms of knowledge and practices of electric arc welding. Then, the skills acquired were quantitatively measured using a Likert scale. This analysis is applied with the purpose of objectively evaluating the level

of competence in welding, specifically among those participating in training at Codesa in the canton of Esmeraldas (Castañeda, 2022).

The target population of this study is composed of participants or beneficiaries who previously registered through a Google platform. Initially, there was a group of 30 pre-registered participants. However, at the time of conducting the questionnaire, 28 of these registrants participated, as detailed in Table 1. These participants make up both the population and the sample to which the questionnaire will be applied. The choice of this sample is based on social impact indicators previously used for the evaluation of social outreach projects, which were developed by Cioppo and Bello at the Agrarian University of Ecuador (2018).

Participants were informed that the Luis Vargas Torres University, responsible for arc welding training at Codesa, will publish a scientific article based on the results obtained from this outreach activity. In this context, consent was obtained from the authorities and the community for the application of the questionnaire. It is important to note that the confidentiality of the respondents' answers was guaranteed, and at no time will personal data be collected on the form.

This approach strictly adheres to the human rights and well-being of the individuals involved, who are treated as research subjects with the utmost responsibility and respect for ethical values. This approach reflects a commitment to cause no harm to participants, maintaining the principles of justice, impartiality, and equity throughout the survey process as a research tool (Regulations on Bioethics and Biosafety in Scientific Research at the Technical University "Luis Vargas Torres" of Esmeraldas).

A questionnaire consisting of 18 questions is used, designed to evaluate various dimensions that form part of the variables that impact the beneficiaries of the outreach project. These dimensions include participation, organization, human resources, and continuing education. Participants express their responses in the survey using a five-point scale: 1 (Strongly agree), 2 (Somewhat agree), 3 (Neither agree nor disagree), 4 (Somewhat disagree), and 5 (Strongly disagree). In addition, data related to gender and age indicators are collected for a more comprehensive and contextualized analysis of the results.

Within the methodology used to process the survey results in the context of Codesa's outreach, the Likert scale is used as an essential tool. This scale allows participants to express their opinions and assessments in relation to various aspects, providing a quantitative structure for data collection. Each survey question is presented with a series of statements, and respondents select their level of agreement or disagreement on a scale ranging from "strongly disagree" to "strongly agree." "The development of questionnaires and scales shows that thinking in purely quantitative or qualitative terms is an increasingly theoretical exercise and less consistent with the search for a deep understanding of social phenomena; thus, the Likert scale is essential for cataloging qualitative data" Costa et al. (2024).

To process the survey results in the context of Codesa's outreach, Microsoft Excel is used as a fundamental tool. This software allows for the efficient organization, tabulation, and analysis of the data collected through the survey. The results are entered into spreadsheets, where statistical calculations can be performed, graphs and comparative tables can be generated, and trends and patterns in respondents' answers can be evaluated. In addition, Excel facilitates the generation of reports and visualizations that help to understand the survey findings in a clear and concise manner, which in turn contributes to informed decision-making and the formulation of recommendations in the context of community engagement (Mairongo, et al., 2023).

## Results

The results are presented in a consolidated table, compiled from the survey instrument, covering various dimensions such as citizen participation in electric welding, educational development, and training activities. In addition, aspects related to human resources, both trainers and students, as well as the gender, age, and ethnicity of the participants are included. The training impact indicators are presented clearly, expressed in absolute values and percentages. This detailed structuring of the data facilitates an effective understanding of the results, which in turn simplifies the interpretation and analysis of participants' perceptions of the training and its impact on the Codesa community.



**Table 1.** *Results of the survey of beneficiaries in Codesa.*

Nr o	PREGUNTAS	Muy de acuerdo	Algo de acuerdo	Ni de acuerdo Ni en desacuerdo	Algo en desacuerd o	Muy desacuerd o	Tota l
1	¿Cómo califica el lugar donde se llevó la actividad de capacitación y su accesibilidad?	21	6	1			28
2	¿Qué grado de satisfacción genera el medio y tiempo de antelación con el que fue convocado a esta actividad?	17	10		1		28
3	¿Trabajo en equipo durante la capacitación?	18	6	4			20
4	¿Participó de forma activa en grupos de trabajo?	20	6	2			28
5	¿Como valora la organización del curso realizado por la Universidad Técnica Luis Vargas Torres de Esmeraldas?	20	4	3		1	28
6	¿Cómo califica las condiciones de aula para el aprendizaje?	18	7	2		1	28
7	Duración y horarios del curso	10	9	5	4		28
8	Existió la debida atención del instructor a los participantes.	24	3	1			28
9	¿Cómo califica los conocimientos adquiridos?	23	3	2			28
10	Metodología empleada durante las prácticas	17	9	1		1	28
11	Cree usted que se cumplió con los objetivos de la capacitación	28	7	2	1		28

12	Se realizo la aplicación de los contenidos en las actividades practicas	21	5	1	1		28
13	Considera que es necesario recibir otra capacitación en nuevos temas	22	5	1			28
14	¿Cuáles son sus expectativas positivas frente a la vinculación de la Universidad con la comunidad?	22	2	4			28
15	La realización del presente curso ha brindado la oportunidad de capacitarse en Soldadura Eléctrica por Arco Voltaico.	20	5	1	2		28
16	Genero	Masculin o	22	Femenino	6		28
17	Marque el rango de edad en que se encuentra	18-25	26-35	36-45	46-60	61 o mas	0
		20	7	1			28
18	Etnia	Mestizo	Montubi o	Afroecuatorian o	Indígena	Blanca	0
		25		3			28

The results regarding citizen participation in CODESA Esmeraldas's engagement with society reflect a positive perception on the part of participants. Regarding the first question, on the rating of the venue where the training activity took place and its accessibility, 75% of respondents (21 people) said they "strongly agreed," while 21.4% (6 people) said they "somewhat agreed," and only one person (3.6%) remained neutral. Regarding the second question, related to the degree of satisfaction with the means and the time in advance with which they were summoned, 60.7% (17 people) expressed "strong agreement," 35.7% (10 people) were "somewhat in agreement," and one person (3.6%) was "somewhat in disagreement." These results show a high level of acceptance and satisfaction with the logistical and organizational conditions of the training activities promoted by Codesa.

The results regarding citizen participation in Codesa Esmeraldas's engagement with society show a collaborative and active attitude on the part of the participants during the training sessions. In relation to the question about teamwork, 90% of respondents (18 people) expressed "strong agreement," while 30% (6 people) indicated

"some agreement," and 20% (4 people) remained neutral. Regarding active participation in working groups, 71.4% (20 people) said they "strongly agree," 21.4% (6 people) "somewhat agree," and 7.1% (2 people) did not express a definite position. These results reflect a high level of commitment and collaboration among participants, which demonstrates the effectiveness of the group dynamics implemented by Codesa to encourage active participation and teamwork.

The results regarding the level of organizational training development at Codesa Esmeraldas reflect a positive assessment of the training activities carried out in collaboration with the Luis Vargas Torres Technical University of Esmeraldas. Regarding the organization of the course, 71.4% of participants (20 people) indicated that they "strongly agree," while 14.3% (4 people) "somewhat agree," and 10.7% (3 people) remained neutral; only one person (3.6%) stated that they "strongly disagree." Regarding the classroom conditions for learning, 64.3% (18 people) expressed "strong agreement," 25% (7 people) expressed "some agreement," and 7.1% (2 people) did not express a definite position; one person (3.6%) expressed "strong disagreement." Regarding the duration and schedule of the course, 35.7% (10 people) "strongly agreed," 32.1% (9 people) "somewhat agreed," 17.9% (5 people) were neutral, and 14.3% (4 people) "somewhat disagreed." These results show a high level of satisfaction with the organization and conditions of the course, although areas for improvement in duration and schedules were identified in order to optimize the training experience.

The results regarding the level of organizational training development at Codesa Esmeraldas highlight a very positive perception of the attention provided by the instructors during the training sessions. 85.7% of participants (24 people) said they "strongly agree" with the statement that the instructor provided adequate attention, while 10.7% (3 people) indicated they "somewhat agree," and only one person (3.6%) remained neutral. These results reflect a high level of satisfaction with the performance and commitment of the instructors, which is essential for the success of the training activities and the achievement of the learning objectives at Codesa.

The results regarding the training activity indicator at Codesa Esmeraldas show a highly positive assessment by the participants. Regarding the knowledge acquired, 82.1% (23 people) rated their

experience as "strongly agree," while 10.7% (3 people) were "somewhat agree," and 7.1% (2 people) remained neutral.

Regarding the methodology used during the training, 60.7% (17 people) expressed "strong agreement," 32.1% (9 people) "some agreement," and one person (3.6%) was neutral; only one person (3.6%) "strongly disagreed." Finally, regarding the fulfillment of the training objectives, 71.4% (28 people) indicated that they "strongly agree," 25% (7 people) "somewhat agree," 7.1% (2 people) are neutral, and one person (3.6%) "somewhat disagrees." These results reflect a high level of satisfaction with the training activity, highlighting the effectiveness of the knowledge imparted, the methodology used, and the fulfillment of the objectives set.

The results regarding the training activity indicator at Codesa Esmeraldas show a positive perception of the application of the content in practical activities. Seventy-five percent of participants (21 people) said they "strongly agree" with the statement that the content was applied appropriately, while 17.9% (5 people) said they "somewhat agree." One person (3.6%) remained neutral, and another (3.6%) said they "somewhat disagree." These results reflect that the majority of participants considered the transfer of theoretical knowledge to practice to be effective, which is essential for consolidating learning and ensuring the usefulness of training in real contexts.

The results regarding the human resource-trainers (students) indicator at Codesa Esmeraldas reflect a high rating and positive expectations for the training activities. Seventy-eight point six percent of participants (22 people) consider it necessary to receive further training on new topics, while 17.9% (5 people) "somewhat agree" and one person (3.6%) remains neutral.

Regarding positive expectations regarding the University's connection with the community, 78.6% (22 people) expressed "strong agreement," 7.1% (2 people) "some agreement," and 14.3% (4 people) were neutral. In addition, 71.4% (20 people) stated that the course provided an opportunity to receive training in electric arc welding, while 17.9% (5 people) "somewhat agreed," 3.6% (1 person) were neutral, and 7.1% (2 people) "somewhat disagreed." These results highlight the relevance of training, the importance of

university-community links, and the need to continue strengthening these training processes.

The results regarding the gender variable at Codesa Esmeraldas show greater male participation in training activities. Of the total of 28 participants, 78.6% (22 people) are male, while 21.4% (6 people) are female. These data reflect a gender gap in participation, suggesting the need to implement strategies that encourage greater inclusion of women in training programs, thus promoting equity and equal access to training and development opportunities.

The results regarding the age variable at Codesa Esmeraldas indicate that the majority of participants are in the 18-25 age range, representing 71.4% of the total (20 people). This is followed by the 26 to 35 age group with 25% (7 people), while 3.6% (1 person) corresponds to the 36 to 45 age range. No participants were registered in the 46 to 60 age range or 61 years and older. These data reflect that training activities are predominantly aimed at a young audience, highlighting the importance of designing inclusive programs that also cater to older people, thus promoting intergenerational participation.

The results for the ethnicity variable in Codesa Esmeraldas show a predominance of participants of mestizo origin, representing 89.3% of the total (25 people). This is followed by the Afro-Ecuadorian ethnicity with 10.7% (3 people), while no participants from the Montubio, indigenous, or white ethnicities were registered. These data reflect a predominantly mestizo ethnic composition in the training activities, suggesting the need to implement strategies that promote greater inclusion and participation of other ethnic groups, thus strengthening cultural diversity in training programs.

## Conclusions

The study "Evaluation of Arc Welding Training at Codesa, Esmeraldas: Diagnosis and Recommendations" identified that the outreach activities carried out by the Mechanical Engineering program at the Luis Vargas Torres Technical University have had a positive impact on the community. Participants expressed a high level of satisfaction with the organization, classroom conditions, and methodology used during the practical sessions. The application of

theoretical content in practical activities was viewed favorably, reflecting the effectiveness of the training approach and its contribution to the development of technical skills in arc welding.

In terms of citizen participation, there was evidence of active engagement by attendees, who highlighted the importance of teamwork and collaboration during the training sessions. However, the results also revealed a gender gap and limited ethnic diversity among participants, with a predominance of mestizo men and low representation of women and other ethnic groups. This suggests the need to implement inclusive strategies that promote greater equity in access to these training opportunities.

With regard to human resources, the trainers were highly valued for their attention and dedication, which contributed to the achievement of the course objectives. Participants expressed their interest in receiving further training on related topics, reflecting the importance of continuing to strengthen these community outreach programs. In addition, the importance of the partnership between the Casa de la Juventud in Codesa and the Luis Vargas Torres Technical University was highlighted as an effective mechanism for promoting community development and labor market integration.

However, areas for improvement were identified, such as the duration and schedule of the course, which were pointed out by some participants as aspects that could be optimized. It was also recommended that the coverage of the training be expanded to include older people and people from different ethnic groups, thus ensuring a more inclusive approach that is representative of the cultural diversity of Esmeraldas.

In conclusion, arc welding training has proven to be an effective tool for developing technical skills and improving the working conditions of local entrepreneurs. The results obtained reinforce the importance of continuing to promote this type of initiative, adapting it to the specific needs of the community and promoting greater equitable participation. This study provides valuable recommendations for strengthening future outreach activities, contributing to the socioeconomic development of the province of Esmeraldas.

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