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Development of the Training Resource for Shielded Metal Arc Welding (SMAW) NC II: Process, Analysis, and Acceptability

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ABSTRACT

The study was conducted to develop a training resource for Shielded Metal Arc Welding (SMAW) NC II. Its primary objective was to explore the development process of a training resource for SMAW II and to evaluate its acceptability based on expert feedback in terms of format, learning content, presentation and organization, relevance, and functionality. Guided by the ISD Model and the ADDIE framework, the development process followed four essential stages: a) Needs analysis, which involved identifying and assessing learning gaps and required competencies based on the K–12 Basic Education Curriculum for Technology and Livelihood Education (SMAW for Grades 11-12), TESDA's SMAW NC II Training Regulations, Welding Procedure Specification requirements, and relevant industry demands; b) Design setting, where clear objectives were formulated, and the content was thoughtfully selected and structured, including activities and feedback strategies aligned with the learning goals; c) Material development, which focused on producing training resources anchored on the design and implementation blueprint; and d) Evaluation, wherein subject matter experts reviewed and validated the materials to ensure quality, relevance, and instructional value. The evaluation revealed that the resource training was Highly Acceptable, with mean scores of 4.83 for format, 4.93 for Content, 4.78 for presentation and organization, 4.96 for relevance, and 4.90 for functionality. With an acceptability mean score of 4.88, interpreted as "Highly Acceptable", the experts' evaluation affirms the training resource's effectiveness, relevance, and appropriateness for its intended purpose.

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INTRODUCTION

Welding remains an essential skill in many industries, and the need for competent welders continues to grow. Achieving industry-level proficiency goes beyond just gaining experience; it also involves undergoing comprehensive training and having access to well-crafted learning materials that combine theoretical concepts with hands-on practice (Chakradhar et al., 2022). Therefore, it is crucial to consider the processes involved in developing training resources for Shielded Metal Arc Welding (SMAW) NC II. Effective training materials are vital for equipping students with the necessary skills and knowledge to succeed in the industry. SMAW, widely known as stick welding, is one of the most commonly used methods because of its cost-effectiveness, accessibility, and versatility.

Given its widespread application in sectors such as construction and manufacturing, SMAW is an essential skill for aspiring welders. Research on augmented reality based SMAW training highlights the importance of aligning evaluation mechanisms with industry recognized welding standards to ensure students are fully prepared for real world assessments (Maña & Cuasito, 2023). Consequently, developing skill acquisition tools for SMAW NC II is crucial in equipping learners with the expertise needed to succeed in the labor market. A well-structured and skill-oriented training resource in SMAW NC II is needed as welding technologies advance quickly and the need for qualified professionals increases. Good training materials can bridge the knowledge gap between theory and practice, guaranteeing that students are ready to meet industry standards. Additionally, these resources support the development of critical skills that are essential for creating high-quality welds, such as preparation, electrode selection, and weld inspection. To guarantee that graduates have the skills needed to thrive in the profession, vocational schools must also update their curricula to meet the expectation of the modern industry (Sutrizona et al., 2020).

Creating effective training resources for practical skills in educational and vocational institutions remains a critical yet complex task in the Philippines. With industries, especially welding, continuing to seek skilled professionals, the lack of well-organized and locally relevant training materials has become more evident. The absence of comprehensive and standardized instructional resources has contributed to inconsistencies in skill development nationwide. In programs like Shielded Metal Arc Welding (SMAW) NC II, the lack of uniform training resources presents a significant obstacle in ensuring students acquire the necessary competencies to meet industry requirements. One major challenge in developing practical training resources is the absence of a clearly defined methodology for their creation. One way to address this issue is by developing a structured framework grounded in established instructional models and design principles. This framework should include needs assessment, goal setting, content development, sequencing, training activities, and evaluation serving as a guide to ensure that training materials are comprehensive, relevant, and of high quality. These components collectively play a crucial role in designing training resources that support both the development of practical skills and alignment with industry standards.

This research explores the methodology for developing a training resource for the SMAW NC II program, focusing on the key elements of process, analysis, and acceptability. It examines various training strategies, content development approaches, and assessment techniques that can be integrated to enhance the resource's quality. By creating a resource specifically tailored to learners' needs and aligned with industry standards, the study aims to improve the overall quality of SMAW NC II training and support the preparation of competent welders equipped to succeed in a competitive job market. Motivated by the identified gap, the researcher undertakes this study to strengthen the effectiveness and relevance of SMAW NC II instructional materials.

OBJECTIVES OF THE STUDY

This study aimed to develop and evaluate the acceptability of a training resource for Shielded Metal Arc Welding NC II for Senior High School SMAW II students.

METHODOLOGY

The study adopted a descriptive survey approach to gather data on mobile phone use and its effects on academic performance. The method permits researchers to gather rich and reliable data directly from the population of interest. Fraenkel et al. (2019) argue that survey methods allow researchers to analyse various variables, making them well-suited to investigating the implications of this trend in the context of education.

This study adopted a developmental research approach guided by the ADDIE Model, Analysis, Design, Development, Implementation, and Evaluation, in developing a training resource for Shielded Metal Arc Welding NC II. The model provided a practical structure that allowed the researcher to move step-by-step, beginning with identifying learning needs and competency gaps, followed by designing and developing the material, and refining it through implementation and evaluation. This iterative process ensured that the training resource remained aligned with competency-based standards and industry expectations. The study involved a group of respondents composed of experts comprising welding specialists and curriculum development experts, who evaluated both the technical and instructional aspects of the training resource material. In addition, industry representatives from sectors such as shipbuilding, construction, maintenance, and sugar milling were also engaged during the needs assessment phase to provide insights on required workplace competencies.

Data were collected using a combination of survey questionnaires, interview guides, and assessment tools. The survey instrument measured the acceptability of the training resource in terms of format, content, organization, presentation, relevance, and functionality using a Likert scale. To establish content validity, the instrument was reviewed by seven experts using Lawshe's Content Validity Ratio (CVR), where all items achieved a CVR of 1.00, exceeding the minimum requirement of 0.99, indicating that the items were essential and appropriate. The interview guide, consisting of ten questions focused on industry skill requirements, also underwent the same validation process and was found to be highly valid. Reliability was ensured through consistent administration of the instruments and clear alignment of items with the study objectives.

The procedure followed an Input–Process–Output flow within the ADDIE framework. During the analysis phase, competency requirements, skill gaps, and industry expectations were identified through document review and interviews. The design and development phases involved organizing content and creating training activities that progressed from basic to advanced welding skills. The implementation phase was excluded considering its not within the scope of the study and will be the focus of the next phase of the study which is the field testing, while the evaluation phase focused on the acceptability of the training resource through expert review and trainers feedback.

Both quantitative and qualitative methods were used in analyzing the data. Quantitative data from the surveys were treated using weighted mean and standard deviation to determine the level of acceptability while frequency counts and percentile ranks were also applied to summarize responses from industry participants. Qualitative data gathered from FGDs were analyzed using thematic content analysis to identify recurring patterns related to strengths, limitations, and areas for improvement. Overall, the methods employed in this study allowed for a careful and balanced evaluation of the training resource, combining measurable results with practical insights from experts, trainees, and industry stakeholders.

RESULTS AND DISCUSSION

On the Development of Training Resources for SMAW NC II: The ADDIE Design Phase

In developing the training resources for SMAW NC II, the study used the ADDIE framework, Analyze, Design, Develop, Implement, and Evaluate, within the broader Instructional Systems Design (ISD) model. This structure helped organize the research in a clear and systematic way, guiding how data were collected, analyzed, and interpreted while supporting accuracy, consistency, and validity. It also informed the choice of research methods, such as surveys or case studies, to suit the goals of the study. For this work, the focus was limited to the Analyze, Design, and Develop and Evaluate stages, with implementation set aside as outside the present scope, so the chapter highlights the design and development of the training materials.

On the Analyze Stage: Curriculum Gap Analysis for SMAW NC II

In the Analyze stage of ADDIE, the researcher conducted a needs analysis to determine the key training requirements for SMAW NC II and ensure the training resource would respond to both industry and academic demands. By consulting stakeholders and examining current industry expectations, the analysis helped align the curriculum with the technical skills and safety competencies that SMAW NC II graduates must possess. This step allowed trainers and faculty to design instruction that prepares learners for real-world welding careers. The existing welding curriculum was reviewed by comparing the DepEd curriculum guide with the TESDA Training Regulations for SMAW NC II, Welding Procedure Specifications (WPS), and industry requirements. Through this comparison, gaps in skills and competencies were identified, especially between what DepEd currently offers and what TESDA, WPS, and the industry require. The detailed gap analysis, are presented in tables below.

Based on the findings, the training resource was developed to match the competency standards specified in the TESDA Training Regulations for SMAW NC II. It focuses on core welding competencies such as:

a) Welding carbon steel plates in the flat position (1F)
b) Welding carbon steel plates in the horizontal position (2F)
c) Welding carbon steel plates in the vertical position (3F)
d) Welding carbon steel plates in the groove flat position (1G)
e) Welding carbon steel plates in the groove horizontal position (2G)
f) Welding carbon steel plates in the groove overhead position (4G)

These competencies ensure that the training resource is aligned with national certification requirements and equips trainees with the skills needed for certification and employment in the welding industry.

Table 1. Title Competency Mapping for SMAW NC II for Pipe Welding Across Different Positions

Standard Welding Classification Position (WPS)	DepEd Curriculum Map	TESDA SMAW NC II Training Regulations Competencies	Industry Needs (Based on WSP Standards set by AMWS)
Pipes			
2G (Horizontal)		Weld carbon steel Pipes groove horizontal position (2G)	Pipe welded in horizontal position
5G (Vertical Fixed)		Weld carbon steel pipes groove vertical position (5G)	Pipe welded in vertical fixed position
6G (Inclined 45° Fixed)		Weld carbon steel pipes groove inclined 45^0 Position (6G)	Pipe welded in inclined 45° fixed position

The table reveals a clear gap between DepEd's welding curriculum and TESDA's SMAW NC II standards, particularly in pipe welding and WPS requirements. DepEd does not explicitly cover key welding positions like 2G (horizontal), 5G (vertical fixed), and 6G (inclined 45° fixed), while TESDA trains welders in these groove positions to meet industry needs. This suggests that DepEd-trained students may lack essential skills in several plate and pipe positions, limiting their readiness for TESDA certification and employment in sectors such as oil and gas, construction, and manufacturing. The mismatch also means there is currently no comprehensive, hands-on training resource in DepEd that aligns SMAW NC II core competencies with TESDA and industry standards. Updating the curriculum to include pipe welding skills and integrating competency-based training materials would help bridge this gap, improve students' employability, and ensure smoother progression from basic welding education to professional certification and real-world practice.

On Industry Needs Assessment

This study included an industry needs assessment to identify the specific skills and qualifications that employers look for when hiring welders. The assessment was conducted through survey interviews with industry heads and the chairs of the Human Resource Merit, Selection, and Promotion Board (HRM-PSB), whose standards directly shape hiring practices. The survey consisted of ten key questions grouped into two main areas: (a) general hiring requirements for welders, such as qualifications and certifications, and (b) the technical skills and competencies needed in the job. The responses provided clear insights into what employers expect in terms of credentials, experience, and hands-on welding abilities. The findings are presented in tables, with the participating industries coded as follows: Local Ship Building Construction (LSBC), Education Sector Maintenance Unit (ESMU), Structural Construction Company (SCC), and Sugar Milling Project and Maintenance Units (SMPM1 and SMPM2).

Table 2. Industries Confirming the Employment of Welders (N=5)

On the question of whether the organization hires welders.	**Industry Code**					**Total**	**%**
Responses	LSBC	ESMU	SCC	SMPM1	SMPM2		
Yes	✓	✓	✓	✓	✓	5	100
No	X	X	X	X	X	0	0

The table presents survey results from five industries on their hiring practices for welders. All industries (100%) reported that they still need welders, as shown by the checkmarks (✓), and none indicated a shortage, reflecting a steady and continuous demand for welding professionals across different sectors. These findings show that skilled welders remain essential in various industries, which means training programs must keep pace with changing industry standards. For graduates to be job-ready, they need the right technical skills and recognized certifications. Building stronger links between schools and industry, and updating curricula to include specialized welding techniques, will help close existing skill gaps and prepare future welders more effectively for the workforce.

Table 3. Minimum Qualifications Required for Hiring Welders (N=5)

Industry Code	College Level	College Graduate	Vocational certificate	High School Diploma
LSBC				✓
ESMU			✓	
SCC			✓	
SMPM1				✓
SMPM2				✓
Total			2	3

The second survey question, which asks about the minimum qualifications industries require for hiring welders, shows clear differences across sectors, as seen in Table 6. Two industries (ESMU and SCC) require at least a vocational certificate, while three (LSBC, SMPM1, and SMPM2) accept applicants with only a high school diploma. Notably, none of the industries require a college degree, emphasizing that welding roles value hands-on skills and technical training more than advanced academic credentials. These variations in minimum qualifications also reflect different levels of skill expectations across industries. Some employers see a high school diploma as enough, while others prefer candidates with formal vocational training, likely because it signals stronger technical competence and better preparedness for the job.

Table 4. Certificates or Licenses Required for Hiring Welders (N=5)

Industry Code	SMAW NC II	FCAW	GTAW	GMAW	ASME	ABS	COSH	OSHA
LSBC	✓	✓	✓	✓	✓	✓	✓	✓
ESMU	✓	✓	✓	✓				✓
SCC	✓	✓	✓					
SMPM1	✓	✓	✓	✓				
SMPM2	✓	✓	✓	✓				
Total	5	5	5	4	1	1	1	2

The table shows that the certificates and licenses required for hiring welders vary across industries. All five industries require SMAW NC II, FCAW, and GTAW certifications, underscoring these as core qualifications for welders. Four industries (LSBC, ESMU, SMPM1, and SMPM2) also require GMAW certification, which suggests it is highly valued but not universally mandatory. LSBC alone requires ASME and ABS certifications, reflecting its adherence to more specialized welding standards often used in shipbuilding and pressure vessel work. Likewise, COSH certification is compulsory only for LSBC, highlighting its strong focus on safety compliance, while LSBC and ESMU both require OSHA certification, indicating a broader emphasis on international safety practices. These differences in certification requirements reveal how standards and expectations shift by industry. Some emphasize advanced technical welding skills, while others place greater importance on safety regulations, depending on their specific work environment and risks. At the same time, several industries stated that any of the listed certifications can qualify an applicant for a welding position, showing that multiple pathways can meet the same hiring criteria.

Table 5. On Industries Training Preference Required for Hiring Welders (N=5

Industry Code	Yes	No
LSBC	✓	
ESMU	✓	
SCC	✓	
SMPM1	✓	
SMPM2	✓	
Total	5	

When asked whether industries prefer to hire welders with formal training from institutions like TESDA and others, all respondents answered affirmatively. This demonstrates that employers place significant value on certified welding skills, ensuring candidates meet industry standards for both technical proficiency and workplace safety.

Table 6.Minimum Number of Years Required for Hiring Welders (N=5)

Industry Code	1 Year	2 Years	3 Years
LSBC	✓		
ESMU	✓		
SCC		✓	
SMPM1	✓		
SMPM2	✓		
Total	4	1	

The data in the table show that the minimum years of experience required for hiring welders vary across industries. Four industries (LSBC, ESMU, SMPM1, and SMPM2) require at least one year of experience, indicating that these employers are willing to hire welders with limited industry exposure, provided they have the necessary skills. In contrast, one industry (SCC) requires two years of experience, suggesting a preference for welders with more hands-on expertise.

Table 7. Industry Screening Process in Hiring Welders (N=5)

Process	LSBC	ESMU	SCC	SMPM1	SMPM2
Review of applicants credentials (certificates, training, etc)	✓	✓	✓	✓	✓
Shortlisting of applicants	✓	✓	✓	✓	✓
Conduct of interview	✓	✓	✓	✓	✓
Conduct of Performance Test/Trade Test (skill test in GMAW, SMAW, safety, etc.)	✓	✓	✓	✓	✓
Rank applicants	✓	✓	✓	✓	✓
Total	5	5	5	5	5

The table above illustrates the screening and selection process as described by industry respondents. Typically, the process begins with a review of applications, where the candidates' credentials, certifications, and relevant work experience are examined. Those who are shortlisted are invited for an initial interview, which assesses their technical expertise, problem-solving abilities, and attitude toward the workplace. Following the interview, candidates undergo a welding performance test (also known as a trade test) to showcase their skills in

SMAW, GMAW, or other relevant welding processes. In addition, safety awareness evaluations are conducted to confirm compliance with workplace safety standards. The final selection is based on a combination of test results, interview performance, and overall competency. Applicants are ranked according to their performance, with hiring decisions made based on these rankings.

Table 8. Required Welding Processes and Technical Skills

Industry	SMAW	GMAW	FCAW	GTAW
LSB	✓	✓	✓	✓
ESMU	✓			
SCC	✓			
SMPM 1	✓	✓	✓	✓
SMPM2	✓	✓	✓	✓

Based on the table above, all identified industries require Shielded Metal Arc Welding (SMAW). This is followed by Gas Metal Arc Welding (GMAW), Flux-Cored Arc Welding (FCAW), and Gas Tungsten Arc Welding (GTAW), which are essential in LSB, SMPM1, and SMPM2. However, ESMU and SCC only require SMAW and do not demand the other welding processes. This is supported by the American Welding Society career path in welding which states that SMAW is commonly employed in construction, shipbuilding, and fabrication due to its versatility and durability. GMAW is often preferred for its speed, precision when working with delicate metals, and ease of operation. FCAW is essential for heavy equipment and offshore projects, while GTAW is crucial for precise welding of stainless steel and aluminum.

Table 9. Technical Skills Looked for Welders

Skills	LSB	EDMU	SCC	SMPM 1	SMPM2
Expertise in various methods and techniques	✓	✓			
Ability to work in different positions	✓	✓	✓	✓	✓
Read and interpret drawings, blueprints, and welding symbols	✓	✓	✓	✓	✓
Weld in various metals like carbon steel, stainless steel, and aluminum.	✓	✓	✓	✓	✓
With an understanding of welding defects	✓	✓	✓	✓	✓
Safety	✓	✓	✓	✓	✓

As revealed on the table, welders are expected to have a range of essential skills, which include:

1. Expertise in various welding methods and techniques, as well as the ability to work in different positions.
2. The capacity to read and interpret technical drawings, blueprints, and welding symbols.
3. Hands-on experience with a variety of metals such as carbon steel, stainless steel, and aluminum.
4. A solid understanding of common welding defects and the ability to identify and correct them.
5. A strong commitment to following safety guidelines and using personal protective equipment (PPE) properly.

Table 10. Responses for Welding Performance Test

Industry	**Yes**	**No**
LSB	✓	
ESMU	✓	
SCC	✓	
SMPM1	✓	
SMPM 2	✓	

Table 10 shows that all of the industry participants require a welding performance test or trade test before hiring welders.

Table 11. Responses on the Test Involved During the Trade Test

Responded Criteria Inclusion	LSB	EDMU	SCC	SMPM 1	SMPM2
Material preparation and machine setup	✓	✓	✓	✓	✓
Execution of various weld joints, including butt joints, fillet welds, and groove welds	✓	✓	✓	✓	✓
Quality of the welds through visual inspection, bend tests, and Non-Destructive Testing (NDT).	✓	✓	✓	✓	✓

As shown on this table, all participants required welding applicants to undergo a practical welding performance test and this test includes tasks such as material preparation, machine setup, and the execution of various weld joints, including butt joints, fillet welds, and groove welds in different positions. The quality of the welds is evaluated through visual inspection, bend tests, and Non-Destructive Testing (NDT).

Table 12. Responses on the Common Materials Thickness Welded by Welders

Thickness of Materials	**LSB**	**EDMU**	**SCC**	**SMPM 1**	**SMPM2**
Mild steel 20	✓	✓	✓	✓	✓
Structural Steel 80	✓	✓	✓	✓	✓

As shown on the above table, regarding materials and thicknesses, industries typically use mild steel and structural steel, ranging from schedule 20 to schedule 80. The results emphasize the essential qualifications and skills that industries seek when hiring welders. Formal certification, particularly TESDA NC II, is a fundamental requirement, while certifications from AWS and other specialized organizations add significant value. The selection process is thorough, involving interviews, welding performance tests, and safety evaluations. Additionally, technical proficiency in various welding processes and strong problem-solving skills are crucial in determining a candidate's suitability. These findings offer valuable insights for aligning training programs with industry needs, ensuring that welding graduates have the competencies necessary to meet workforce demands.

On Review of TESDA and AWS Standards

The researcher reviewed the TESDA Training Regulations for SMAW NC II and the Welding Procedure Specification (WPS) from the American Welding Society (AWS), a globally recognized welding standard.WPS is an official document that details how a specific welding process should be performed, ensuring consistency, quality, and compliance. It includes key elements such as the welding process type; base metal and filler metal specifications; preheat and interpass temperatures; welding position; shielding gas; electrical settings; joint design and preparation; welding technique; and inspection and testing requirements. Given that the study focuses on welding skill development, the review centered on the core competencies outlined in these standards. These include fillet weld positions (IF, 2F, 3F, 4F, single and multiple passes, including cover pass), groove weld plates (IG, 2G, 3G, 4G, single and multiple passes with cover pass), and groove-type pipe positions (2G, 5G, 6G, first pass, single pass, multiple pass, and cover pass). The 6G position is considered the most advanced and complex, and these competencies were integrated into the training resource.

The Design Stage

During the Design stage, the researcher planned the learning objectives, content, sequence of welding skills, and related training activities for the SMAW training resource. These elements were based on the earlier needs analysis to ensure alignment with both industry and educational goals. The design identified the specific skills learners must master and described the supporting materials, including content structure, learning activities, and feedback mechanisms. The format follows TESDA's Training Methodology Course and Competency-Based Learning Materials, which are guided by Competency-Based Training (CBT) standards such as clearly defined learning outcomes, organized instructional content (e.g., information sheets, job sheets, self-checks), explicit performance criteria, practical and written assessment tools, and workplace-simulation tasks for hands-on practice.

The Development Stage

The Development stage, also referred to as the Training Resource Materials Plan Design and Implementation (TRMPDI), focused on creating the actual training content. The researcher built the materials in line with the established objectives, format, skills progression, and learning activities, ensuring that they met the design specifications and effectively supported the target competencies.

The Evaluation Stage

In the Evaluation stage, the training resource was reviewed by six expert validators: three experienced welding professionals recognized as masters in the field, and three specialists in training resource development and curriculum design. Among the curriculum experts, two held PhD degrees, one served as a DepEd supervisor, and all others had master's degrees. Drawing on their combined expertise, they evaluated the resource for alignment with industry standards and educational frameworks, as well as its overall acceptability. The assessment covered format, learning content, presentation, organization, relevance, and functionality, with the results summarized using mean scores and presented in the tables that follow.

Table 13. Experts' Level of Acceptability of the Developed Training Resource When Taken as to Format and Its Specific Criteria (N=6)

Parameters and Criteria	Expert Evaluators' $\bar{x}$	SD	Verbal Interpretation
Format			
The Training Resource format is appealing	4.67	0.52	Highly Acceptable
The layout is easy to navigate.	5.00	0	Highly Acceptable
It follows a consistent style and structure throughout and cultural context	5.00	0	Highly Acceptable
The font is easy to read.	5.00	0	Highly Acceptable
Printing is of good quality (i.e., no broken letters, even density, correct alignment, and properly placed aligned)	4.33	0.52	Highly Acceptable
Illustrations are simple and easily recognizable.	5.00	0	Highly Acceptable
They clarify and supplement the text.	4.83	0.41	Highly Acceptable
They are properly labeled or captioned (if applicable)	4.83	0.41	Highly Acceptable
They are realistic and appropriate colors are used.	4.83	0.41	Highly Acceptable
Total	4.83	0.24	Highly Acceptable

As shown in the table, the expert evaluators rated the format of the training resource as highly acceptable, with a mean score of 4.83. Experts found the layout easy to navigate (5.00), the style and structure consistent with the cultural context (5.00), and the font highly readable (5.00). The illustrations were clear, realistic, and appropriately labeled (4.83). The only minor concern was the printing quality (4.33), suggesting small improvements in text clarity and alignment.

Table 14.Experts' Level of Acceptability of the Developed Training Resource When Taken as to Learning Content and Its Specific Criteria (N=6)

Parameters and Criteria	Expert Evaluators' $\bar{x}$	SD	Verbal Interpretation
Learning Content			
The content is comprehensive and covers key topics.	4.83	0.41	Highly Acceptable
The content matches the intended competencies, standards, or curriculum goals	5.00	0	Highly Acceptable
The content is up-to-date date and relevant**.**	5.00	0	Highly Acceptable
Concepts are sufficiently explained, providing the necessary depth for the learners' level	5.00	0	Highly Acceptable
The training resource is stimulating and	4.83		Highly Acceptable

encourage active participation or and application of target welding skills		0.41	
Total	**4.93**	**0.22**	**Highly Acceptable**

The content of the training resource was rated as highly acceptable across all criteria (4.83 to 5.00). Experts confirmed that it comprehensively covers key topics (4.83), aligns well with competency standards and curriculum goals (5.00), and remains current and relevant (5.00). Additionally, the resource was praised for stimulating engagement and encouraging hands-on welding skill application (4.83).

Table 15. Experts' Level of Acceptability of the Developed Training Resource When Taken as to Presentation and Organization and Its Specific Criteria (N=6)

Parameters and Criteria	Expert Evaluators' $\bar{x}$	SD	Verbal Interpretation
Presentation and Organization			
Information and skills are presented in a logical sequence that promotes understanding	4.83	0.41	Highly Acceptable
Key concepts are highlighted effectively.	4.67	0.52	Highly Acceptable
The visuals, colors, and layouts effectively enhance readability	4.83	0.41	Highly Acceptable
Total	**4.78**	**0.55**	**Highly Acceptable**

As shown in Table 15, the logical sequencing of information (4.83), effective highlighting of key concepts (4.67), and use of visuals to enhance readability (4.83) were all rated highly acceptable. The structured and organized approach improves comprehension and usability for instructors and learners alike.

Table 16. Experts' Level of Acceptability of the Developed Training Resource When Taken as to Relevance and Its Specific Criteria N=6

Parameters and Criteria	Expert Evaluators' $\bar{x}$	SD	Verbal Interpretation
Relevance			
The training resource addresses the needs of learners.	4.83	0.41	Highly Acceptable
It aligns with industry standards, regulations, and organizational policies, fulfilling all mandatory requirements.	5.00	0	Highly Acceptable
It includes real-world applications or examples.	5.00	0	Highly Acceptable
The content reflects current trends or welding technologies	5.00	0	Highly Acceptable
Total	**4.96**	**0.21**	**Highly Acceptable**

The training resource, as shown in Table 19, received high ratings for addressing learner needs (4.83) and fully aligning with industry standards, regulations, and policies (5.00). It also effectively incorporates real-world applications (5.00) and stays current with evolving welding technologies (5.00), ensuring its relevance to industry demands.

Table 17. Experts' Level of Acceptability of the Developed Training Resource When Taken as to Functionality and Its Specific Criteria (N=6)

Parameters and Criteria	Expert Evaluators' $\bar{x}$	SD	Verbal Interpretation
Functionality			
The training resource is user-friendly and accessible.	5.00	0	Highly Acceptable
It includes practical activities that enhance skill learning	4.83	0.41	Highly Acceptable
It can easily be understood and performed by both students and teachers without unnecessary complexity**.**	5.00	0	Highly Acceptable
It produces results with precision and correctness, aligning with predefined benchmarks or standards.	5.00	0	Highly Acceptable
It demonstrates efficient operation with optimal response time, minimal processing delays, and effective resource utilization.	4.67	0.52	Highly Acceptable
Total	**4.90**	**0.26**	**Highly Acceptable**

Table 17 shows that the training resource was highly rated for its user-friendliness and accessibility (5.00), as well as for its clarity and ease of implementation by both students and teachers (5.00). Practical activities designed to enhance learning also received high ratings (4.83), ensuring that the resource effectively supports skill development. The data indicate that the expert evaluators rated the training resource highly acceptable in all areas, confirming its alignment with industry standards, educational requirements, and practical training needs. While minor improvements in printing quality could enhance readability, the content, structure, and functionality were consistently rated at the highest level. This suggests that the training resource is well-suited for use in welding training programs, effectively bridging the gap between classroom instruction and industry practice. To provide an overall assessment of the training resource, the summary table below is presented.

Table 18. Experts' Level of Acceptability of the Developed Training Resource When Taken as a Whole (N=6)

Parameter	Expert Evaluators' $\bar{x}$	SD	Verbal Interpretation
Format	4.83	0.24	Highly Acceptable
Learning Content	4.93	0.22	Highly Acceptable
Presentation and Organization	4.78	0.55	Highly Acceptable

Relevance	4.96	0.21	Highly Acceptable
Functionality	4.90	0.26	Highly Acceptable
Total	**4.88**	**0.296**	**Highly Acceptable**

Table 18 shows five key parameters that were assessed by six experts in the training resource: Format, Learning Content, Presentation and Organization, Relevance, and Functionality. The overall evaluation resulted in an average rating of 4.88, categorized as "Highly Acceptable," indicating that the resource meets both industry and educational standards. Regarding format (4.83), experts found the layout, structure, and visual elements well-designed and conducive to learning, although minor refinements in printing quality could improve readability. The learning content (4.93) received one of the highest ratings, highlighting its comprehensiveness, accuracy, and strong alignment with industry standards. Experts confirmed that the content is up-to-date, well-structured, and detailed enough to support skill development. The presentation and organization (4.78) were also highly rated, indicating that the material is well-structured and easy to follow. Slight improvements in the sequencing or emphasis on key concepts could further enhance clarity. The highest rating, 4.96, was awarded for relevance, confirming that the resource aligns effectively with industry standards, regulatory requirements, and practical applications. This makes it highly applicable for real-world welding training scenarios. Similarly, functionality (4.90) was praised for its user-friendliness, accessibility, and effectiveness in supporting skill acquisition, particularly through hands-on activities. The overall assessment confirms that the training resource is highly acceptable in all evaluated aspects, demonstrating strong alignment with both industry and educational requirements. Although it is already effective, minor refinements in printing quality and content sequencing could further improve its clarity and usability. Additionally, experts provided the following recommendations for improving the SMAW NC II Training Resource:

a. Ensure proper syllabification when breaking words at line endings.
b. Maintain consistent line length in the "Comments and Suggestions" section of the Performance Criteria Checklist for clarity and readability.
c. Arrange the options in the Self-Check Information Sheet in ascending order of length to improve organization and ease of reference.

All these recommendations were carefully incorporated into the final draft of the SMAW NC II Training Resource, ensuring enhanced clarity, consistency, and usability.

CONCLUSION

The researcher developed the Training Resource for SMAW NC II using a structured and systematic approach, applying the Instructional Systems Design (ISD) model and the ADDIE framework. The study identified key industry requirements, competency gaps, and regulatory standards through an in-depth needs analysis, ensuring that the training resource aligns with TESDA qualifications and Welding Procedure Specifications (WPS).

The design and development phases focused on structuring content, skill progression, and learning activities to ensure effective training and industry relevance. Additionally, the content of the training resource was directly informed by the findings from the needs analysis.

The expert evaluation of the training resource developed for SMAW NC II indicated a high level of acceptability, with an overall mean score of 4.88. This score reflects strong performance across all critical areas, including format, content quality, presentation, organization, relevance, and functionality. The findings suggest that the resource aligns with industry standards, enhances teaching effectiveness, and supports competency-based training approaches.

Additionally, the study underscores the importance of aligning training resources with both industry needs and educational frameworks. By carefully integrating insights from the needs analysis and an extensive review of literature, the research created a structured and effective training resource. This resource is well-positioned for implementation in welding training programs and can serve as a blueprint for future development of similar

instructional materials, ensuring they remain high-quality and relevant to current vocational and technical education needs.

RECOMMENDATION

1. It is highly recommended that the processing of the development of the training resource for SMAW NC II must be adapted. It is crucial to adapt this structured approach to ensure the resource's effectiveness and relevance to industry needs.
2. Conduct field testing of the SMAW NC II training resource. This will help evaluate its effectiveness in improving students' welding skills and ensure learners develop the necessary competencies to meet global industry standards and workforce requirements.
3. Implement continuous feedback, practical assessments, and regular evaluation of the training resource. These measures will support ongoing improvements and ensure that the resource remains aligned with current trends and demands in the welding industry.

IMPLICATIONS

The findings of this study offer valuable insights for improving skills training and acquisition in Shielded Metal Arc Welding (SMAW) NC II. By integrating expert recommendations and aligning the training resource with industry standards, this study helps create a more effective training program. Aligning the training materials with TESDA standards and international benchmarks (e.g., AWS, ASME, ABS) equips students with industry-recognized credentials and enhances their job readiness. This alignment improves employability in both local and global welding sectors. Moreover, regular evaluation ensures continuous improvement, maintaining the relevance and effectiveness of the training program in producing highly skilled welders.

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