

Determining the Professional Development needs of Students using an Augmented Reality Welding System

Introduction

- There is a growing welder deficit in the United States.
- To produce the welder demand, training must become more efficient.
- Simulation technologies are advancing creating new training methods.
- There are limited studies of Augmented Reality (AR), the information gained would provide a deeper understanding to the retention of information that students create.
- AR is used to overlay the real-world environments with digital technologies.
- AR has the potential to lead to improvements in the students' performance overall as they are being assisted with training technology as opposed to traditional real-world training.



Methods

- Single pass 2-F fillet welds on 1/4" mild steel coupons.
- Under guidance of an independent American Welding Society (AWS) Certified Welding Inspector (CWI).
- Lincoln Electric C300 Multi-Process welder connected to the Lincoln Electric REALWELD.
- GMAW, fewer operator-controlled variables allowing beginner and novice welders to learn more easily.
- Parameters scored: work angle, travel angle, CTWD, travel speed, position.
- Parameter scores are based off consistency with the degree of error for both the minimum and maximum tolerances.
- Overall score determined by the percentage of time that all five parameters are within the set tolerances simultaneously.
- Students completed four arc-off passes and three arc-on passes.

Results

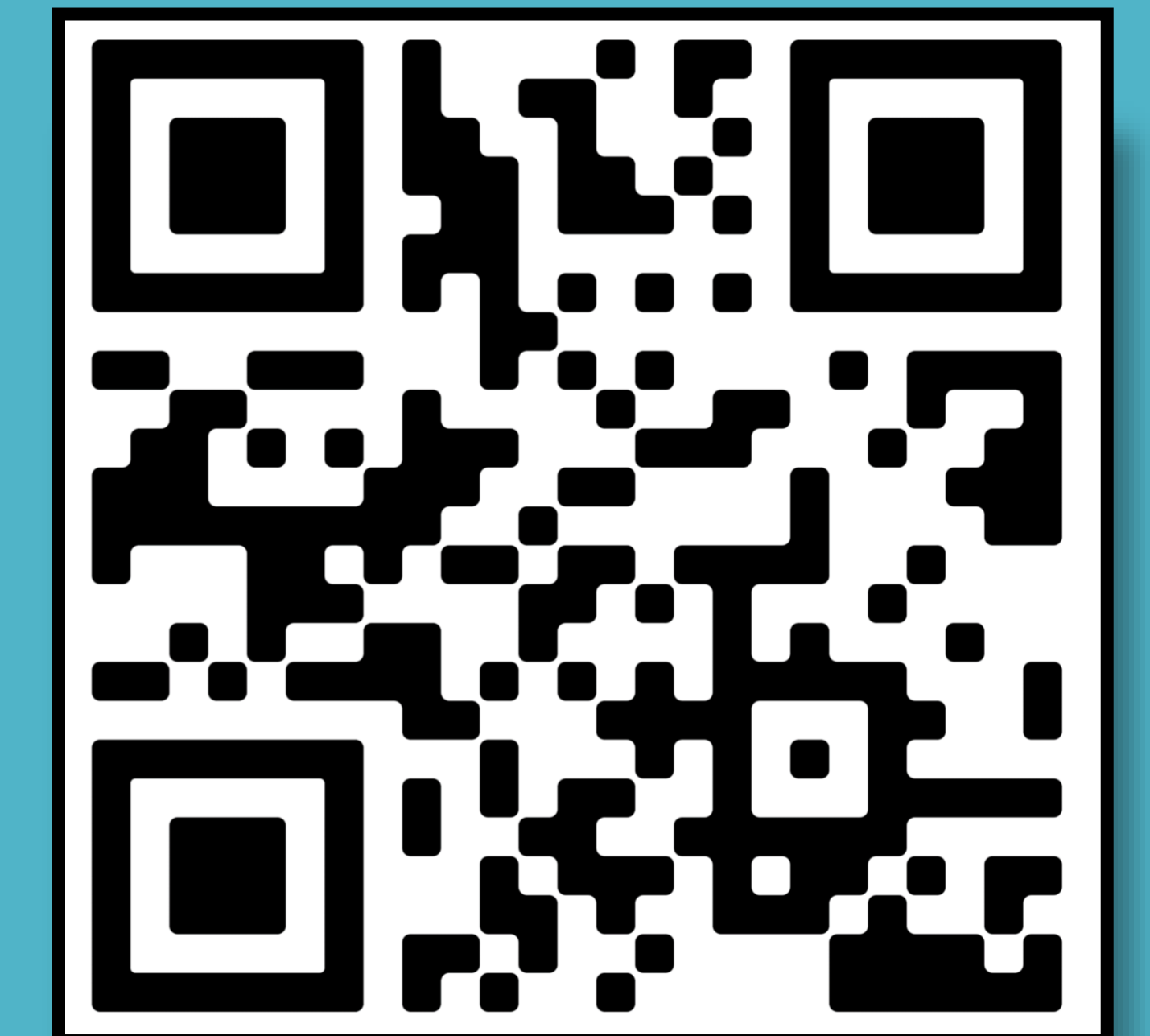
- Participants were able to weld within the allotted ranges for four of the five parameters over 90% of their welds during both arc-on and arc-off modes.
- Statistical significance ($p < 0.05$) between CTWD and travel speed arc-on and arc-off score.

Welding Parameter Arc Off and Arc On Scores

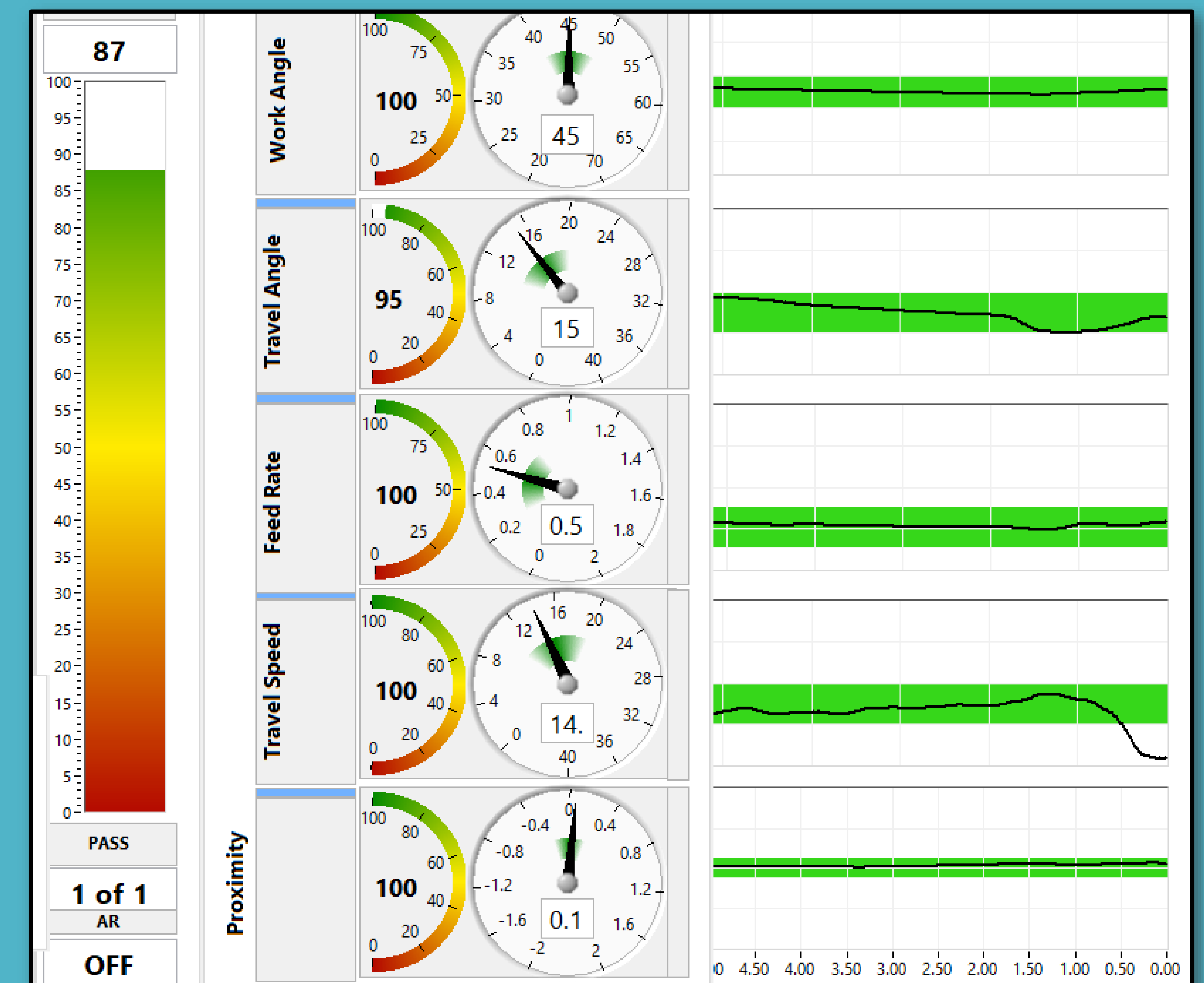
Parameter	Arc Off		Arc On	
	M	SD	M	SD
Work Angle	94.32	13.80	90.98	20.84
Travel Angle	91.27	16.97	89.31	16.89
CTWD	99.11	3.80	90.45	16.95
Travel Speed	73.30	17.25	78.13	20.80
Position	95.87	11.39	95.26	13.15



See the Lincoln REALWELD in action!
Scan QR code!



Lincoln REALWELD Screen Analysis



Recommendations

- Tightening the tolerance ranges for each of the parameters as students improve their welding skills.
- Participants to focus on improving their travel speed in the arc-off mode before transitioning to the arc-on mode.



Theoretical Framework

- Skill acquisition theory
 - Engaging students in learning with feedback instead of repetition will allow them to excel in their skill development.
- Ausubel's assimilation theory
 - Attention of delivering students with meaningful learning education.

Purpose

- To identify the welding professional development needs of students after completing an Augmented Reality training program using Lincoln Electric's REALWELD welding training system.