

Online Training: The Human Factor

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Introduction

STUDENTS, TEACHERS, ONLINE TRAINING

Why use online training

- Consistent high quality training
- Improved productivity
- Lower global training cost

Challenges

1. From the students' point of view
 1. The learning experience
 2. Work vs. training
 3. Getting answers
2. From the teachers' point of view
 1. Evaluating students
 2. Effects of online training on practical training
 3. Adapting to online training

Blended learning

ONLINE + IN-CLASS

Online training

- For the theory
- To familiarize with the concepts of calibration, scanning and data analysis
- To familiarize with real data

In-class training

- To setup an instrument, calibrate a setup, scan and analyse data
- To acquire the manual skills needed for scanning

For a good blending

- The online theory should be instrument neutral
- The instrument specialization should occur during the in-class training
- The online theory must be harmonized with the in-class theory

Students' point of view

THE LEARNING EXPERIENCE

Challenge: Providing an online experience that necessitate no explanation as to its functioning


Solution: A clean user interface presenting only the necessary information combined with a step-by-step learning process

PAUT LEVEL II TRAINING

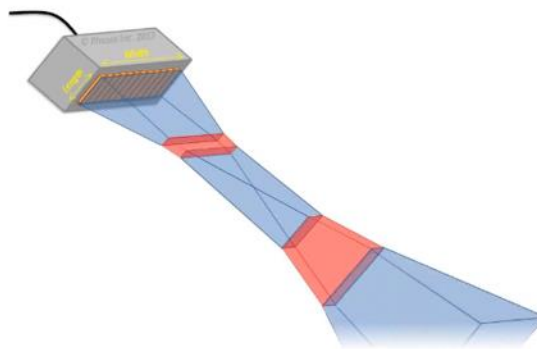
Home Tasters Help Contact Students results Promotion codes Search Dashboard ▾ Richard Rheume ▾

SECTION 4: FOCUSING / CHAPTER 4: BASIC THEORY / BEAM FOCUSING

PASSIVE FOCUSING



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PASSIVE FOCUSING

The focal point along the passive axis is fix and usually different from the one on the active axis.

1. The width of the beam is along the active axis and the length along the passive axis
2. In the first part, the length and width of the beam are getting smaller
3. In the second part, the passive focal zone, the length remain the same but the width continues to get smaller
4. In the third part, the length grows and the width continues to get smaller
5. In the fourth part, the active focal zone, the length continues to grow and the width remains the same
6. Finally in the fifth part, both length and width grow

When using a 2-D probe, the distance of the focal point can be changed along both axis.

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Students' point of view

THE LEARNING EXPERIENCE

Challenge: Going through a 600+ page training can be daunting

Solution: Provide an easily accessible dashboard and an internal search engine

The screenshot displays a web application for 'PAUT LEVEL II TRAINING'. The top navigation bar includes links for Home, Tasters, Help, Contact, Search, Dashboard, and a user profile for Richard Rheume. The main content area is titled 'SECTION 3: STEERING / CHAPTER 4: BASIC THEORY / BEAM STEERING' with a large 'STEERING' heading and a stopwatch icon. A progress bar at the top shows five steps, with the first step active. Navigation buttons for 'BACK' and 'NEXT' are present, along with 'Page 1 / 13'. The content is divided into two columns: 'EXPLANATIONS' and 'FORMULAS AND GRAPHICS'. The 'EXPLANATIONS' column contains text about beam steering, a list of bullet points, a mathematical formula for θ_1 , and a paragraph about wave timing. The 'FORMULAS AND GRAPHICS' column features 'Snell's law' and the formula $\frac{\sin \theta_1}{v_1} = \frac{\sin \theta_2}{v_2}$. The footer includes copyright information for PhaeoX, 2017, and a secondary navigation bar with links for Home, Help, Dashboard, Contact, and Legal notice.

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SECTION 3: STEERING / CHAPTER 4: BASIC THEORY / BEAM STEERING

STEERING

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EXPLANATIONS

Beam steering is an essential part of PAUT. With beam steering it becomes possible to produce beams at different angles with one probe in a fixed position. An area can be covered from a fixed position instead of only one angle with conventional UT.

To understand how beam steering works, a distinction must be made between the way each individual wave composing the beam reacts and how the phased wave front reacts.

- The individual UT waves are always refracting in the part at a fixed angle because the wedge is at a fixed angle. This cannot be modified. If the angle of the wedge is 36° , then the waves refract at 54.5° if the material of the wedge is Rexolite and the part is made of steel

$$\theta_1 = \sin^{-1} \left[\frac{3,240 \text{ m/s} * \sin 36^\circ}{2,340 \text{ m/s}} \right] = 54.5^\circ$$

- By manipulating the timing at which the individual UT waves are fired, it is possible to orient the wave front at different angles in the wedge thus resulting in the wave front being at different angles in the part

So, with parallel individual UT waves going at a fixed angle, it is possible to create multiple beams each with a different angle.

And depending on the angle of the wedge, it is possible to generate shear wave beams or longitudinal wave beams.

FORMULAS AND GRAPHICS

Snell's law:

$$\frac{\sin \theta_1}{v_1} = \frac{\sin \theta_2}{v_2}$$

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Students' point of view

THE LEARNING EXPERIENCE

Challenge: Evaluating the level of understanding

Solution: Provide self-evaluation tests with in-question link to the page presenting the underlying theory

The screenshot displays a web interface for 'TOFD LEVEL II TRAINING'. The top navigation bar includes links for Home, Help, Contact, Students results, Promotion codes, Search, Dashboard, and a user profile for Richard Rheaume. The main content area is titled 'SECTION 3: EVALUATION / CHAPTER 6: SECTION'S TEST / EVALUATION' and 'SECTION'S TEST 3'. A progress bar indicates 'Question 3 / 15' with a 'NEXT' button. The question text is: 'Before doing data analysis on recorded data, the data must be checked for problems. Which of the following is not a problem?'. The options are: 'The amplitude of the lateral wave and backwall fluctuate along the B-Scan', 'The lateral wave signal is above 5% FSH and below 20% FSH', 'Signals other than noise appear before the lateral wave', and 'The mode-converted backwall is within the time window'. A 'CHECK ANSWER' button is at the bottom of the question area. The footer contains copyright information for PhaseX, 2017, and a list of links: Home, Help, Dashboard, Contact, and Legal notice.

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SECTION 3: EVALUATION / CHAPTER 6: SECTION'S TEST / EVALUATION

SECTION'S TEST 3

Question 3 / 15 NEXT

TOFD EVALUATION

Before doing data analysis on recorded data, the data must be checked for problems. Which of the following is not a problem?

- ☐ The amplitude of the lateral wave and backwall fluctuate along the B-Scan
- ☐ The lateral wave signal is above 5% FSH and below 20% FSH
- ☐ Signals other than noise appear before the lateral wave
- ☐ The mode-converted backwall is within the time window

CHECK ANSWER

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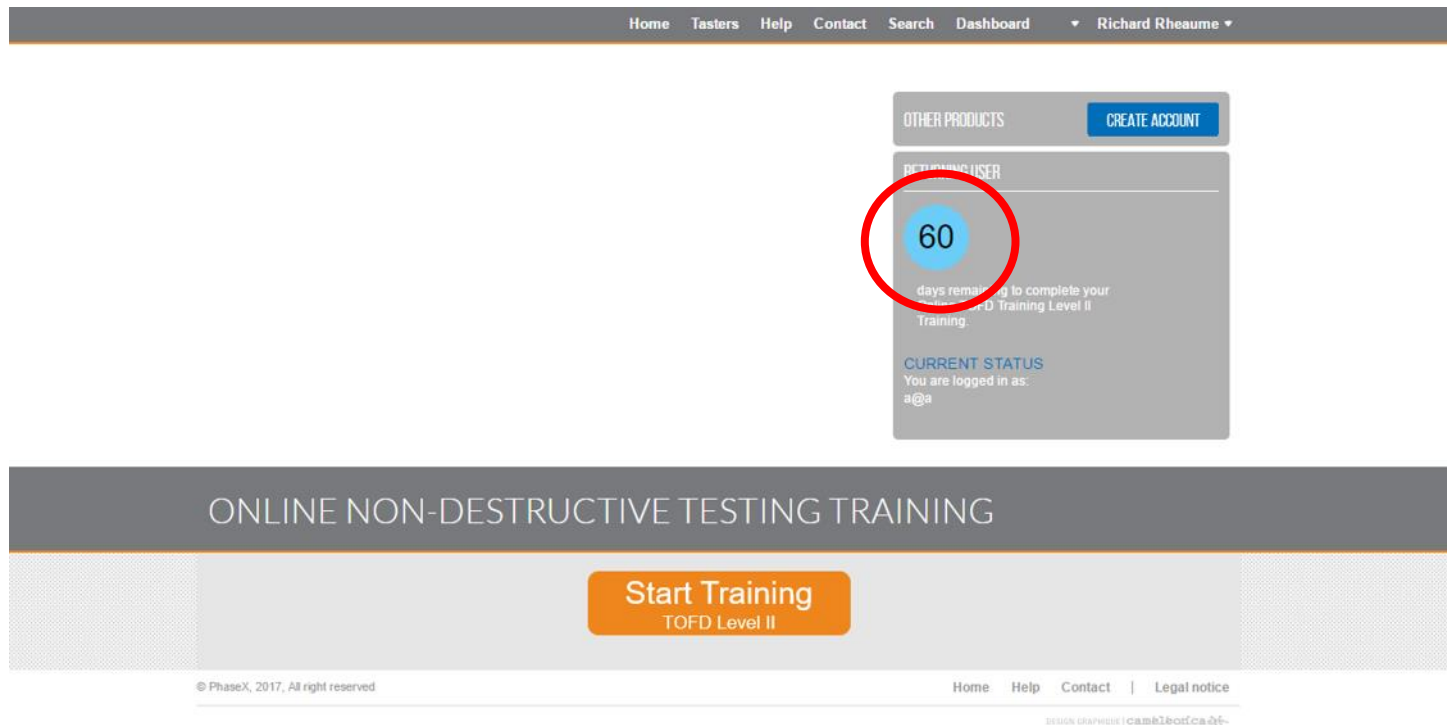
DESIGN GRAPHIQUE | camillebotcau

Students' point of view

WORK VS TRAINING

Challenge: Juggling work and training

Solution: Give a 60-day period to complete the training. Train for an hour each day.



Students' point of view

WORK VS TRAINING

Challenge: Switching from work to study

Solution: Use the flexibility of online trainings to study when and where it is most efficient

Open
24/7

Students' point of view

WORK VS TRAINING

Challenge: Commit to a 1-hour-a-day schedule and take time to revise

Solution: Have a teacher monitoring the student's progress

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STUDENTS RESULTS

Search students results

First Name :

Last Name :

Promotion codes :

Email :

ACTIVE RESULTS

Name	Email	Questionnaire	Date	Result	Reset
Adam		Starting with PAUT - Section's Test 1	2016-07-0	77.78	
Adam		Starting with PAUT - Section's Test 2	2016-08-0	77.78	
Adam		Starting with PAUT - Section's Test 3	2016-08-1	72.22	
Adam		Starting with PAUT - Section's Test 4	2016-08-2	66.67	
Adam		Starting with PAUT - Section's Test 5	2016-08-2	88.89	
Adam		Online PAUT Level II Training - Final Exam	2016-09-02	83.33	

Students' point of view

GETTING ANSWERS

Challenge: Insuring that the theory is well understood

Solution: Videos and animations remain available for the duration of the training

The screenshot displays the 'TOFD LEVEL II TRAINING' dashboard. At the top, a navigation bar includes links for Home, Tasters, Help, Contact, Students results, Promotion codes, Search, and Dashboard, along with a user profile for Richard Rheume. The main heading is 'DASHBOARD'. The left sidebar, titled 'THEORY', lists various sections and chapters, with 'COMPLETED' highlighted in a red circle. The right sidebar, titled 'OVERALL', shows a progress bar and scores: 412 / 413, Theory & Exercice: 409 / 409, Section's test: 3 / 3, and Certification: 0 / 1. The bottom of the page features a footer with copyright information and additional navigation links.

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DASHBOARD

THEORY

COMPLETED

How is it working? >

Section 1: Basics >

Section 2: TOFD Theory >

Section 3: Evaluation >

Overview Section 3 >

Chapter 1: Introduction >

Chapter 2: Basic Theory >

✓ Base Signals

✓ Beam Spread

✓ Indications

✓ Geometrical Indications

Chapter 3: Data Analysis >

Chapter 4: The Defects >

Chapter 5: Full Exercises >

Chapter 6: Section's test >

Section 4: Review >

Final Exam >

TO DO

Final Exam >

OVERALL

412 / 413

Theory & Exercice: 409 / 409

Section's test: 3 / 3

Certification: 0 / 1

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Students' point of view

GETTING ANSWERS

Challenge: Answering the students' questions within a reasonable time frame

Solution: Having a forum monitored by the assigned teacher

The screenshot shows a LinkedIn group page for the 'Phased Array Blended Learning Discussion Group'. The group is 'Unlisted' and has '6 members'. The page header includes the LinkedIn logo, navigation links for 'My Groups' and 'Discover', and a search bar. Below the header, the group's profile picture (a TWI logo) and name are displayed, along with a 'Manage' button. The main content area features a 'Start a conversation with your group' prompt with a text input field labeled 'Enter a conversation title...'. To the right, the 'ABOUT THIS GROUP' section describes it as a 'Forum for students to discuss course with fellow students and TWI lecturers'. Below this, the 'MEMBERS' section shows six member avatars and a count of '6 members'. At the bottom left, a post by 'NEIL HARRAP • Manager' is visible, identifying him as an 'Advanced NDT Lecturer - Principal Project Leader at TWI'. A blue button labeled 'Invite others' is located at the bottom right of the page.

in Back to LinkedIn.com

My Groups Discover Search

TWI Phased Array Blended Learning Discussion Group
Unlisted • 6 members Manage

Start a conversation with your group

Enter a conversation title...

Conversations Jobs

NEIL HARRAP • Manager
Advanced NDT Lecturer - Principal Project Leader at TWI

ABOUT THIS GROUP
Forum for students to discuss course with fellow students and TWI lecturers

MEMBERS 6 members

Invite others

Teachers' point of view

EVALUATING KNOWLEDGE

Challenge: Insuring that the online training covers all required theory


Solution: The online training should be vetted by the teachers giving the in-class training

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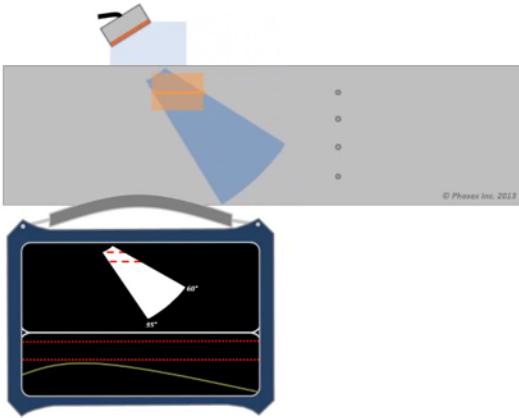
SECTION 3: STEERING / CHAPTER 6: CALIBRATION / TCG

CALIBRATING TCG PAUT



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CALIBRATING TCG PAUT

TCG calibration is used to calibrate an area of the S-Scan so a reflector placed at any angle or depth within this area returns an 80 % FSH signal $\pm 5\%$.

1. The SDHs are chosen in function of the area to be covered
2. The Amplitude level and the tolerance is entered in the instrument
3. The gate is placed over the first SDH. The probe is swept across so all angles cross the SDH. The point is calibrated
4. The probe is swept over the SDH again to verify the calibration. The green position line must be between the two red tolerance lines
5. The gate is placed over the second SDH, the probe is swept and the point is calibrated
6. The point is verified
7. The gate is placed over the third SDH. The probe is swept and the point is calibrated
8. The point is verified
9. The gate is placed over the fourth SDH. Even if the signal from the SDH is not seen on the S-Scan, it can be calibrated. The probe is swept and the point is calibrated
10. The point is verified
11. When the last point is calibrated, the TCG can be accepted. Points can be added after the TCG has been accepted. The TCG compensation line can be seen on the A-Scan

Teachers' point of view

EVALUATING KNOWLEDGE

Challenge: Insuring the students' level of knowledge is sufficient to perform the practical training

Solution: Administrate a final theoretical exam online and a theoretical exam in-class on the first day

The screenshot shows a web application for 'TOFD LEVEL II TRAINING'. The top navigation bar includes links for Home, Tasters, Help, Contact, Students results, Promotion codes, Search, and Dashboard, along with a user profile for Richard Rheume. The main content area is titled 'SECTION 2: TOFD THEORY / CHAPTER 9: SECTION'S TEST / TOFD THEORY' and features a large orange 'FINAL EXAM' heading. Below this, a progress indicator shows 'Question 1 / 15' and a 'NEXT' button. The question itself is: 'What is the effect of the non-linear depth scale on the apparent position of indications?'. It provides four radio button options: 'The backwall appear closer to the lateral wave than it is in reality', 'The backwall appears further from the mode converted backwall than it is in reality', 'Indications appear closer to the backwall than they are in reality', and 'Indications appear closer to the lateral wave than they are in reality'. A light blue rectangular box is positioned below the options for the user's answer. The footer contains copyright information for PhaseX, 2017, and a list of links: Home, Help, Dashboard, Contact, and Legal notice. It also credits the design to GRAPHIQUE | cam31@ofcad.fr.

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SECTION 2: TOFD THEORY / CHAPTER 9: SECTION'S TEST / TOFD THEORY

FINAL EXAM

Question 1 / 15 NEXT

TOFD THEORY

What is the effect of the non-linear depth scale on the apparent position of indications?

- ☐ The backwall appear closer to the lateral wave than it is in reality
- ☐ The backwall appears further from the mode converted backwall than it is in reality
- ☐ Indications appear closer to the backwall than they are in reality
- ☐ Indications appear closer to the lateral wave than they are in reality

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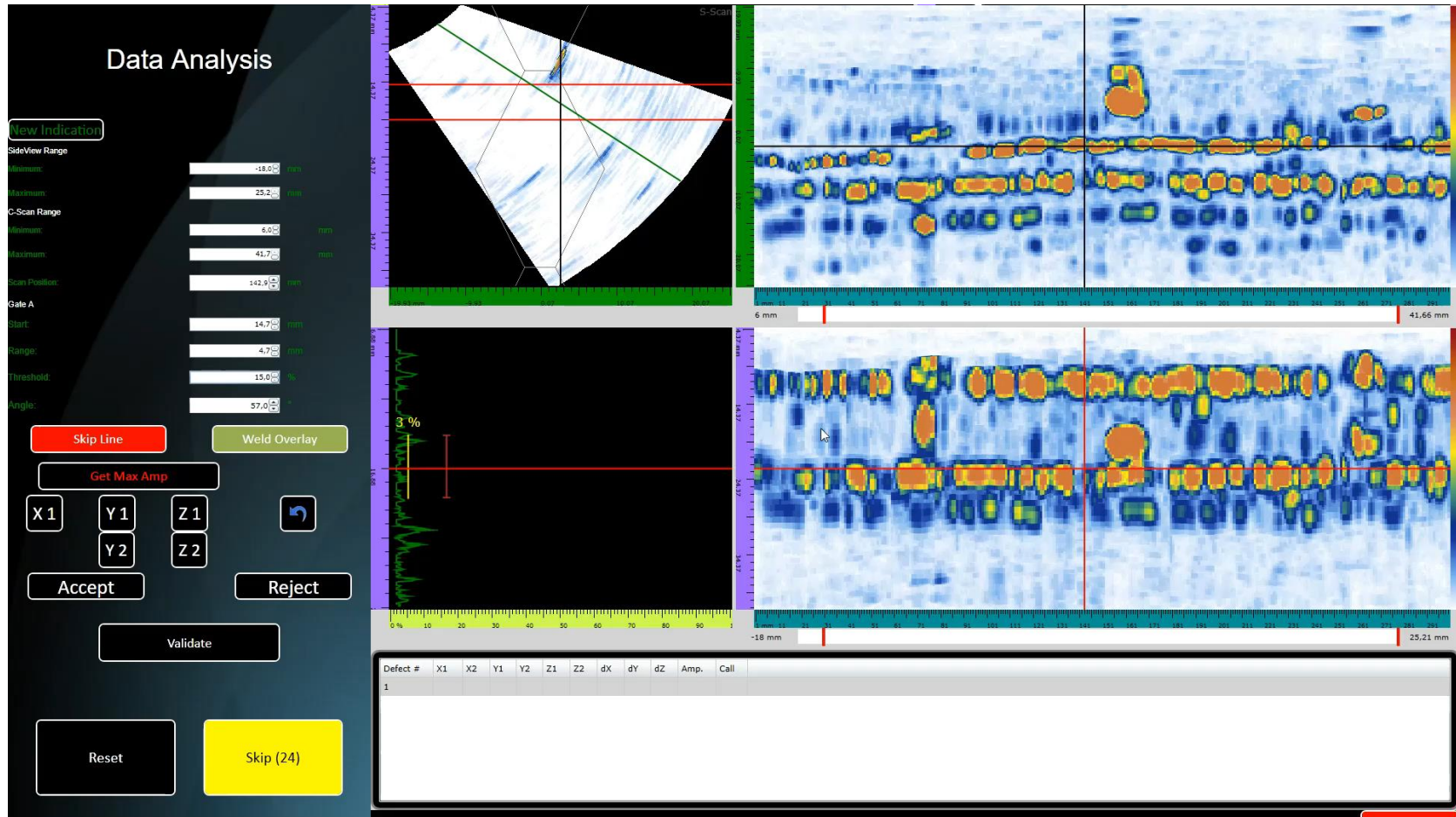
DESIGN GRAPHIQUE | cam31@ofcad.fr

Teachers' point of view

ONLINE TRAINING VS PRACTICAL TRAINING

Challenge: How to learn to calibrate, scan and analyse data without an instrument

Solution: The use of online interactive training exercises

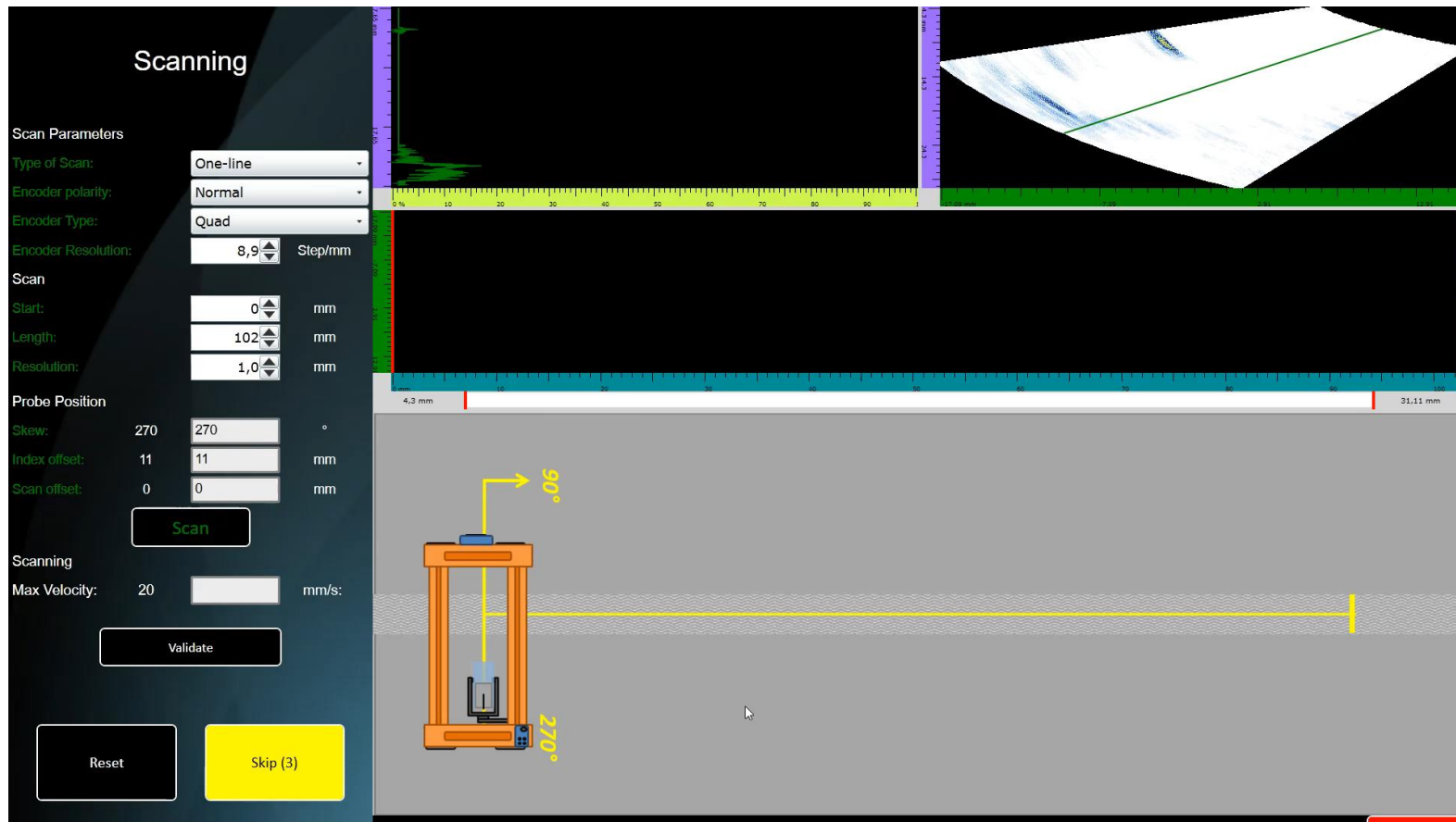


Teachers' point of view

ONLINE TRAINING VS PRACTICAL TRAINING

Challenge: Getting familiar with real data

Solution: Design the online interactive exercises to use real, scanned data from calibration blocks, tank walls and welds



Teachers' point of view

ADAPTING TO ONLINE TRAINING

Challenge: Teaching a class of knowledgeable students

Solution: Use discussions between students rather than lectures



www.toonsup.com/hsbcartoon


Teachers' point of view

ADAPTING TO ONLINE TRAINING

Challenge: Settling arguments

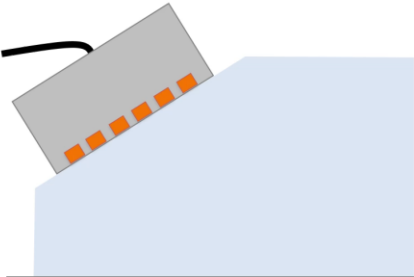
Solution: Use the same online material the students used to settle arguments

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SECTION 3: STEERING / CHAPTER 4: BASIC THEORY / BEAM STEERING
BEAM EXIT POINT

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BEAM EXIT POINT

In PAUT, each beam has its own exit point on the wedge. There is no single exit point like in conventional UT.

1. A beam at 35° is produced by the wave front. It has a specific exit point on the wedge
2. A beam at 55° is produced by the wave front. It has another specific exit point on the wedge
3. Finally a beam at 70° is produced by the wave front. It has another specific exit point on the wedge
4. All the beams in-between have their own exit point

Since the exit point varies for each beam, it is very difficult to give the surface distance from the exit point. This is the reason why the surface distance in PAUT is always given from the front (or back) of the wedge.

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Conclusion

ONLINE TRAINING: THE HUMANFACTOR

- Students appreciate the flexibility offered by online trainings
- Teachers appreciate having better prepared students
- Companies appreciate having their employees close-by while they study

Thank you!