Project Report – Specialist Scholars 2013

This project report form is to be used for Specialist Scholars who received a Grant from the VET Development Centre (the Centre) for 2013 to undertake Study and or other Professional Development activity.

Details of the provider

Institution:	Box Hill Institute
Name of Scholar/Fellow:	Rowan Peter
Project Title/Study Undertaken	Augmented reality – Education and application

1. Project reflection

Write brief comments under the following two headings.

Achievements

What has been achieved so far and is the project/study undertaken up to date with key dates and milestones. Please outline here details of project to date and any issues with progress of project. ***(No more than 350 words)***

My **Augmented reality – Education and application** professional development activity for the Specialist Scholarship program is now complete.

As proposed, I attended the AR Studio Augmented Reality Camp (ARcamp) at the Inspire Centre Canberra, ACT in June 2013. The camp featured two days of AR related presentations, activities and workshops. While the camp wasn't as developer-focused as I had hoped, it did provide me with an overview of how AR is being used in some educational and commercial contexts. ARcamp 2.0 also gave me the opportunity to learn about the object-tracking features of a proprietary augmented reality (AR) platform.

Go to **Appendix A** for more information on the workshops and presentations that took place at ARcamp 2.0.

With the education component of my professional activity complete, I decided to extend my activity to include the development of a small AR experience. Influenced by procedural engineering and industrial AR examples, I designed the concept of augmented contextual instruction.

Go to **Appendix B** for more information about the concept of augmented contextual instruction.

With the assistance of a colleague, I worked with a teacher to apply the concept of augmented contextual instruction to an automotive maintenance procedure.

Go to **Appendix C** for more information about user-interface elements that make up the object-based 'How to disassemble a rear brake caliper'.

Once the correct procedure for the disassembly process was determined, I then created 3D geometry for the augments, recorded instructional video for each step of the disassembly process and then authored and published each channel to the proprietary AR platform.

Go to **Appendix G** for links to blog posts related to ongoing activities and technical problems encountered during the development of 'How to disassemble a rear brake caliper'.

Although 'How to disassemble a rear brake caliper' can be trainer-led, it can also be a self-paced experience. Considering these alternate delivery approaches, I created an instructional poster that provides an entry point into the object-based or image-based experience. The instructional poster could be included in class materials.

Go to **Appendix D** to view the instructional poster for 'How to disassemble a rear brake caliper'.

Improvement opportunities

What improvements/opportunities have you identified by this project/study so far?

(No more than 350 words)

Although 'How to disassemble a rear brake caliper' has technical and functional limitations and imperfections, it serves as a tangible and demonstrable example of how augmented reality, particularly object-based tracking can be used in teaching and learning contexts. With additional research, experimentation and consideration of the limitations and constraints and future features prescribed in the design document, 'How to disassemble a rear brake caliper' could serve as a departure point and give others within the institute and wider VET community the opportunity to develop their own AR experiences.

Go to **Appendix B** and then work your way through **Limitations/Constraints** and **Future features** to learn more about the limitations or constraints of the AR experience and identified for augmented contextual instruction and potential functionality and features that could be considered for future iterations of augmented contextual instruction.

The development of a tangible AR experience gave me the opportunity to conduct a trial with automotive students. Not only did the student trial give me the opportunity to for my work to be evaluated, it also gave me the opportunity to ask students for their thoughts and opinions on possible features and functionality that I'd like to consider for inclusion in future iterations of augmented contextual instruction or other AR experiences.

Go to **Appendix F** for scans of all anonymous survey completed by students who participated in the student trial of 'How to disassemble a rear brake caliper'.

What impact does your study/project have on your role and organisation? *(No more than*

350 words)

My **Augmented reality – Education and application** professional development activity impacted

- **my role** by giving me the opportunity to:
  - develop my practical skills in designing and building augmented reality learning experiences
  - access to technology, equipment and expertise to prototype augmented reality concepts
  - evaluate augmented reality as a technology and then determine how it can be best applied to new and existing learning contexts.
- **the institute** by increasing my knowledge and ability to:
  - report on knowledge gained from the experience to all teaching centres, but also inform any initiatives or programs where augmented reality could be best applied.
  - design and develop augmented reality experiences that could be used enhance the institute's learning materials, existing GPS Learning Pathways student induction and orientation program and other teaching and learning initiatives.
  - evaluate augmented reality as a technology and then determine how it can be best applied to institute programs that are delivered to our GEN partners and other collaborative programs and activities.
  - evaluate augmented reality as a technology and then determine how it can be best used in existing programs that enhance relationships.
  - design and build augmented reality learning experiences that could be integrated into institute programs that help to reduce student attrition.

Appendix A

This appendix contains a small number of photographs taken during ARcamp 2.0 at the INSPIRE Centre, University of Canberra from Monday 20 May to Tuesday 21 May 2013.

The massive video wall at the INSPIRE Centre.

Danny Munnerly introduces campers to the Mini Design Challenge

Go to my ARcamp 2.0 set on Flickr for more photographs from the workshops and presentations or work your way through my summaries of Day 1 and Day 2 of ARcamp 2.0.

Appendix B

This appendix contains the initial design document that informed the development of ‘How to disassemble a rear brake caliper’ augmented contextual instruction.

Augmented contextual instruction
Design document V.01

First published 2013

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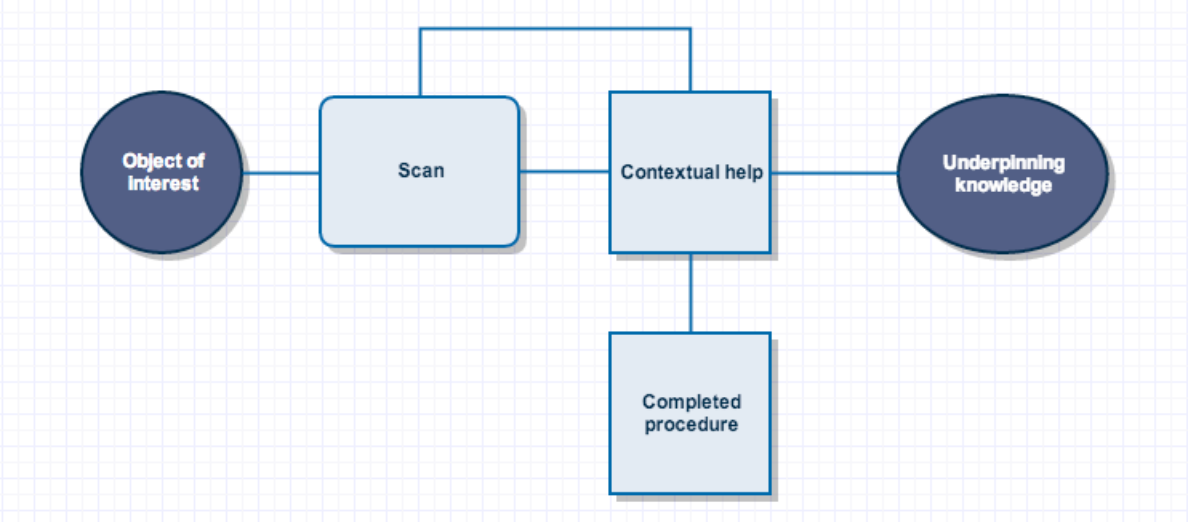
Table of contents

Overview

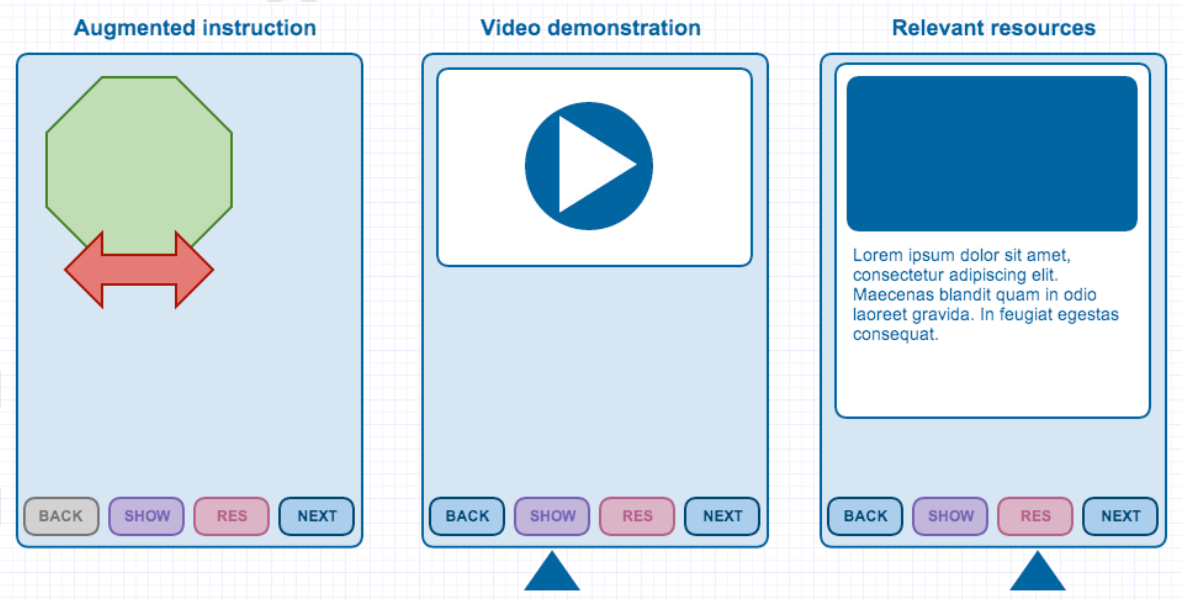
Augmented contextual instruction provides learners with context specific procedural instruction based on recognised images and objects. More specifically, augmented contextual instruction could be used to provide instruction to pre-apprentices in the disassembly and assembly of components that make up a mechanical or electrical device.

Functionality

Learners can use the Junaio app to search BHI channels on Metaio platform for available instruction and then activate the relevant instruction based their image or object of interest. Once recognised, the contextual instruction will guide the learner through a procedure or process such as an assembly or disassembly of a component. Access to underpinning knowledge, resources relevant to the each stage of the procedure or process and functionality to repeat/reverse the instruction will be provided.



This diagram shows onscreen elements that make up the augmented contextual instruction experience.



Delivery approaches

Delivery approaches for augmented contextual instruction include:

- **Trainer-led**

  A trainer will be able to demonstrate a procedure or process to learners in a class or training room session. Learners can then attempt to work their way through the same procedure or process with assistance from augmented contextual instruction. Augmented contextual instruction will provide access to underpinning knowledge and resources relevant to the each stage of the procedure or process.

- **Self-paced**

  Learners can work their own way through a prescribe procedure of process with augmented contextual instruction. Like the trainer-led experience, access to relevant underpinning knowledge and resources will be provided.

Development requirements

The development of augmented contextual instruction requires the following:

- Access to subject matter expert in nominated area to provide instructional advice on the assembly and disassembly procedure for specific component.
- 1 x license for Metaio Creator. Without a license, Metaio Creator operates in Demo mode, which restricts access to features and functionality that is required to develop augmented contextual help. Pricing available on Metaio website. http://www.metaio.com/products/creator/pricing
- Creation of a BHI account on the Metaio developer network to create channels that will be accessed by augmented contextual instruction.
- Create appropriate number of channels and assets for each augmented contextual instruction sequence.
- Access to BHI network and iPads for use with student trial. Metaio's Junaio augmented reality browser needs to be installed.

Limitations/Constraints

The following limitations or constraints have been identified for augmented contextual instruction:

1. Augmented contextual instruction is limited to a single or a very limited number of standalone sequences accessed through Metaio's Junaio augmented reality browser.

2. Augmented contextual instruction will be deployed with Metaio watermark.

3. Augmented contextual instruction is administered through channels hosted on Metaio web platform. Augmented contextual instruction is not connected to, or administered by BHI infrastructure.

4. Learners cannot create new or customise augmented contextual instruction sequences.

Future features

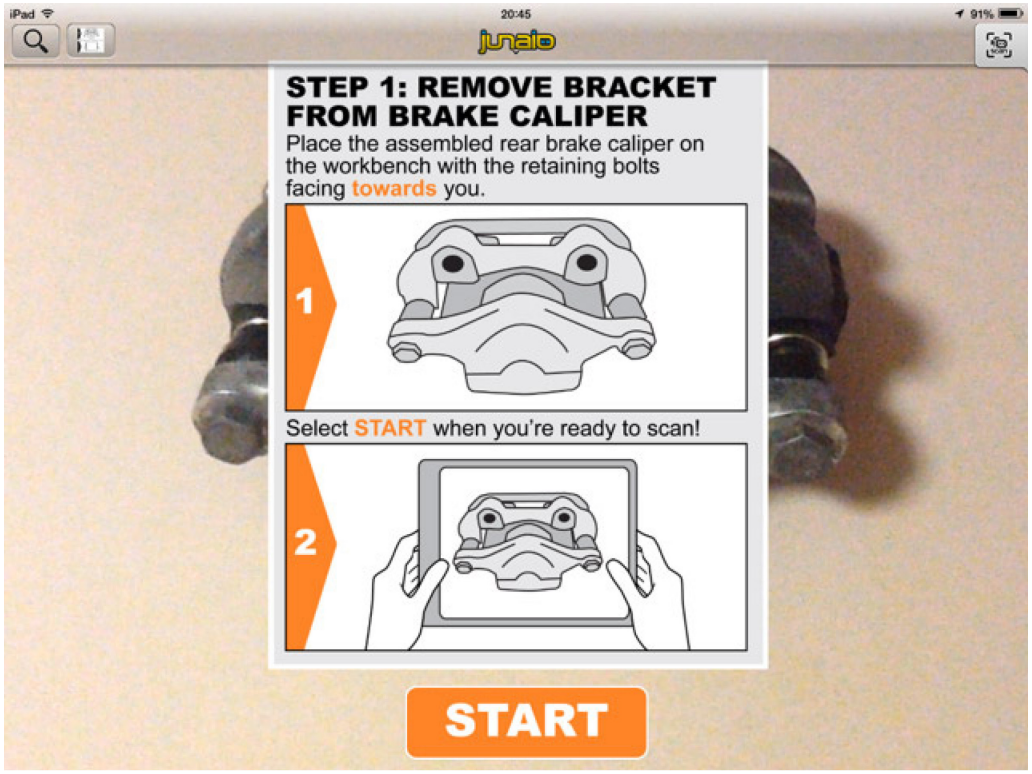
The following functionality and features could be considered for development in future iterations of augmented contextual instruction:

- Depart from use of proprietary augmented reality platforms and pricing paywalls. Pursue development of device and platform agnostic augmented contextual instruction and additional augmented reality experiences for display in web browsers that support HTML5 (JSARToolKit with the WEBRTC getUserMedia API).
- Explore the use of XBOX360 Kinect to capture 3D point cloud data required for image and object recognition as an alternative to Metaio Toolbox
- Explore use of wearable technology such as Google Glass to provide *hands free* contextual instruction without obstruction or interruption. For example, the learner would no longer need to put down their tools or object of interest to activate next step or stage of the contextual instruction.
- Permit creation, customisation and submission of peer and trainer reviewed learner generated contextual instruction to BHI infrastructure such as Generic Competency Units and Apprenticeship Block
- Integrate augmented contextual instruction with existing BHI products such as Mobas and StudentDiary.
- Personalise learner's contextual instruction through analysis and aggregation of their academic submissions to BHI infrastructure.

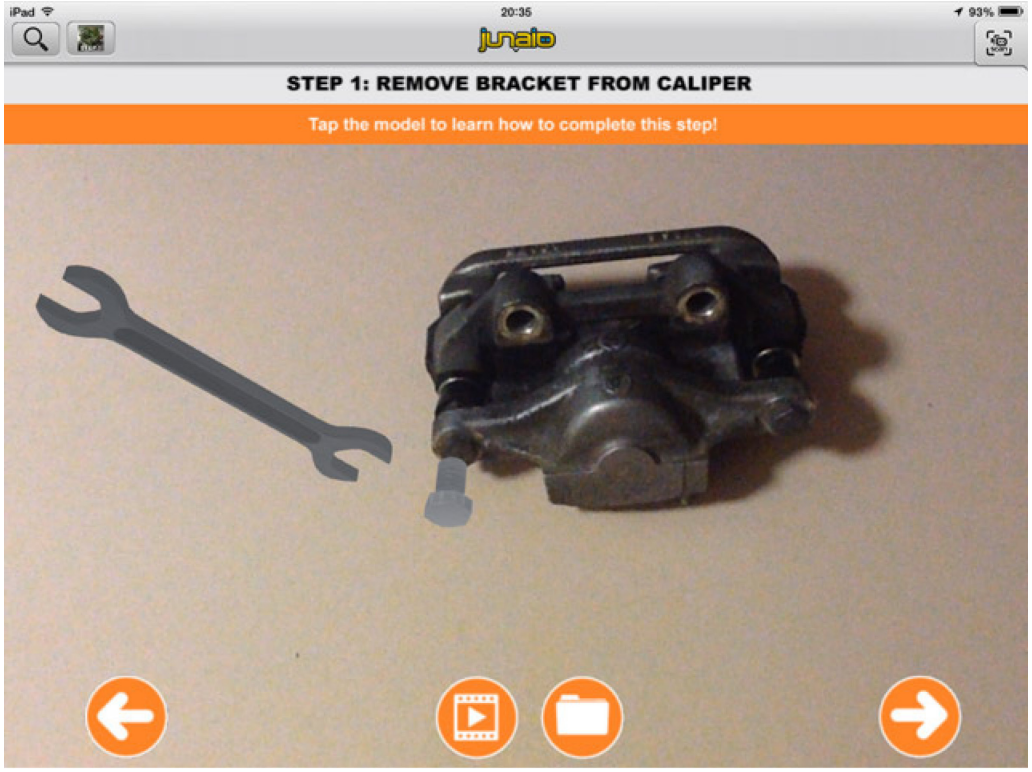
Each specified feature or functionality would need to be scoped, designed, reviewed, discussed and agreed upon before commencement of development.

Appendix C

This appendix contains screen captures of each screen and the user-interface elements that make up the object-based augmented contextual instruction or 'How to disassemble a rear brake caliper'.

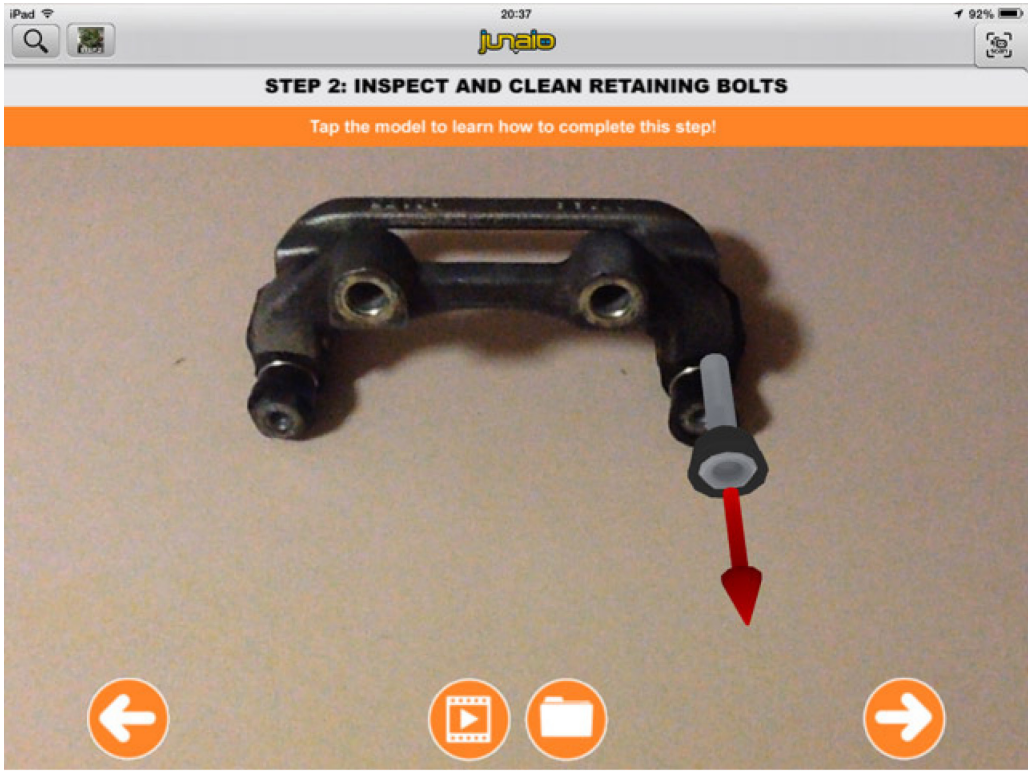


This screen instructs the learner how they're to position their brake caliper to enable the display of the augmented instruction for this step in the disassembly process.

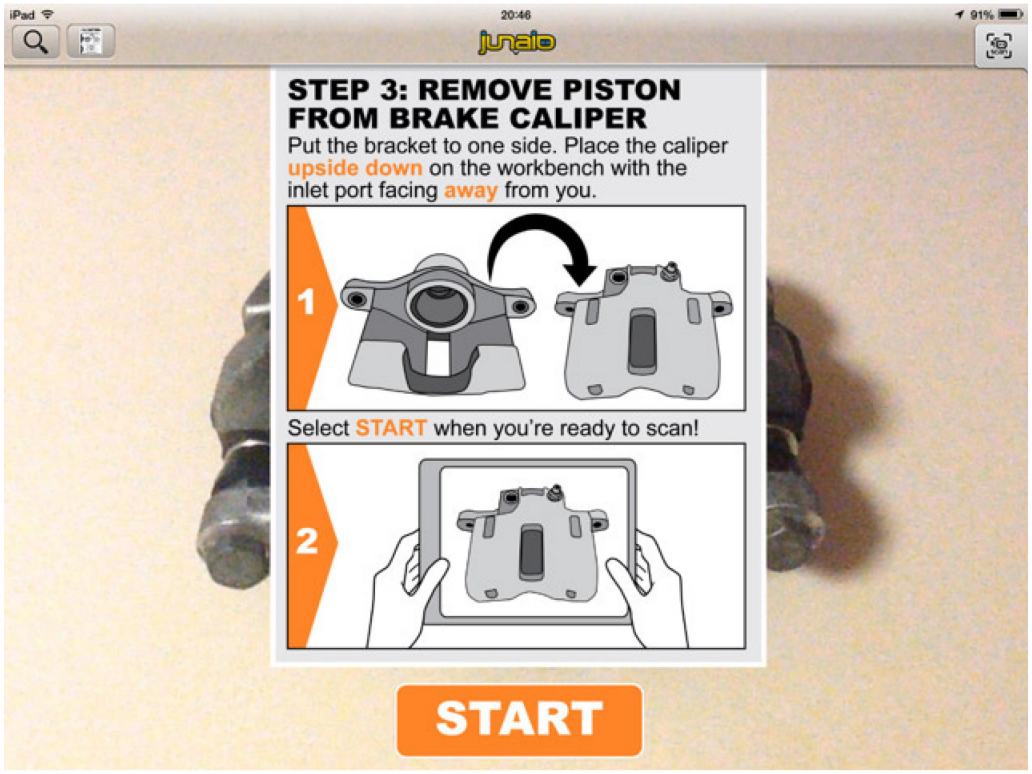


For this step, 3D geometry of a bolt and a tool is placed over the rear brake caliper. Once the 3D geometry is tapped, an animation demonstrates how the tool is to be used to loosen the bolt that attaches the bracket to the caliper. The learner can complete this step with their brake caliper.

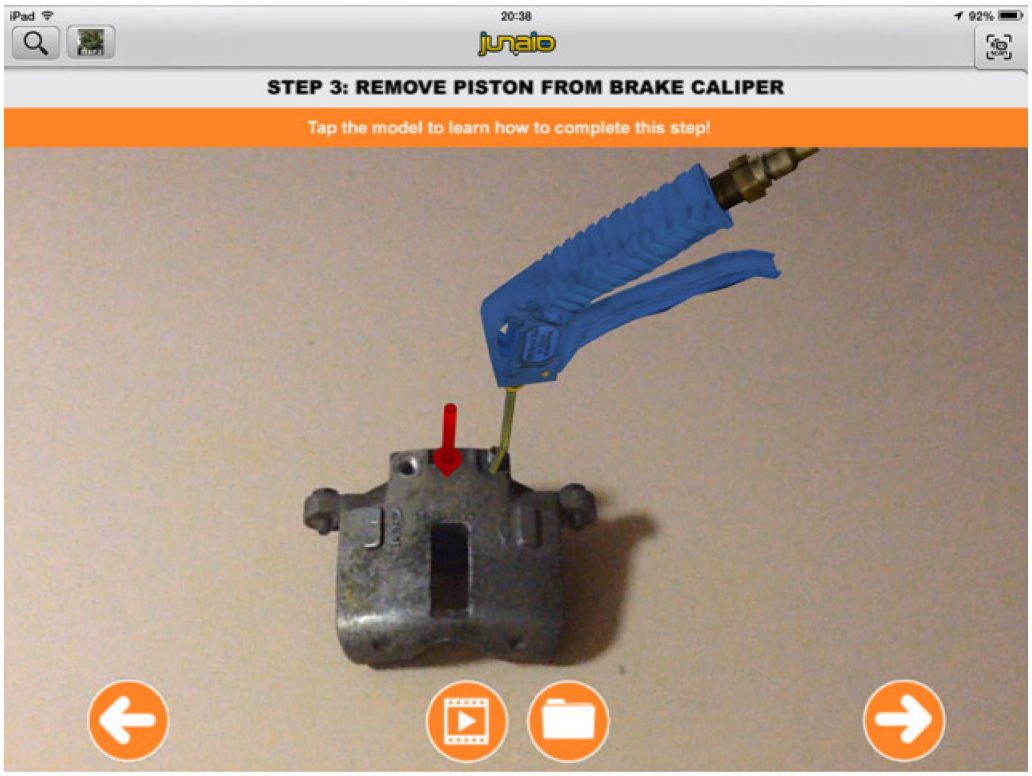
This screen instructs the learner how they're to position their brake caliper to enable the display of the augmented instruction for this step in the disassembly process.



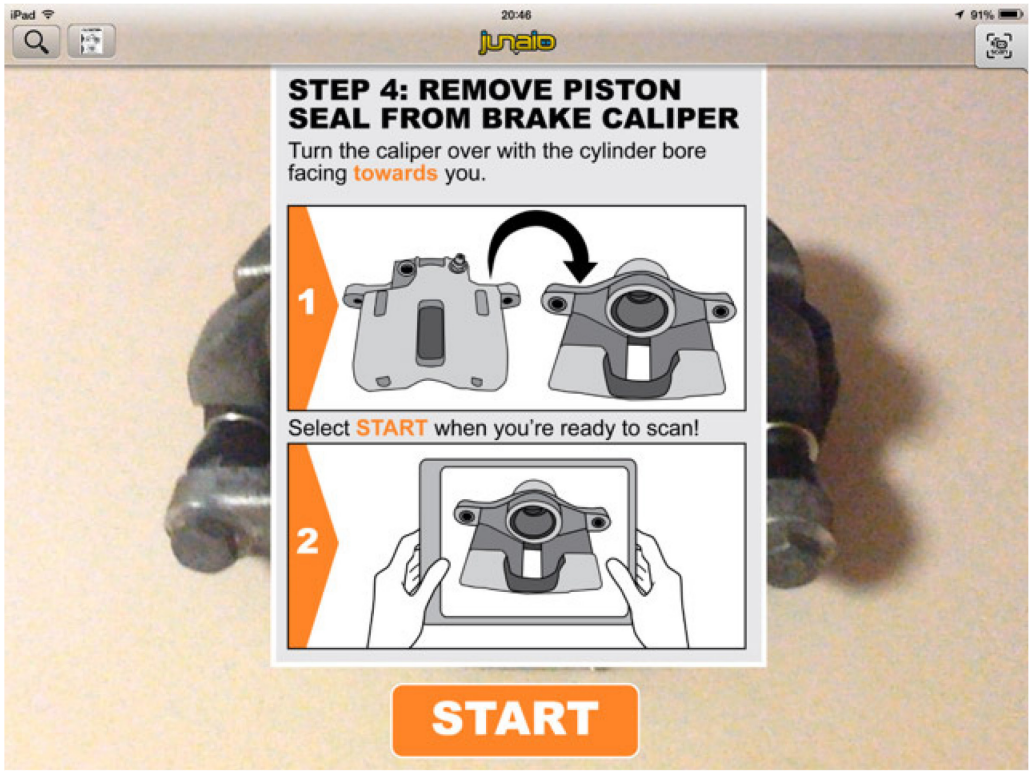
For this step, 3D geometry of a retaining bolt, rubber seal and a directional arrow is placed over the bracket of a rear brake caliper. Once the geometry is tapped, an animation demonstrates how the retaining bolt is to be removed from the bracket. The use can then complete this step with their bracket.



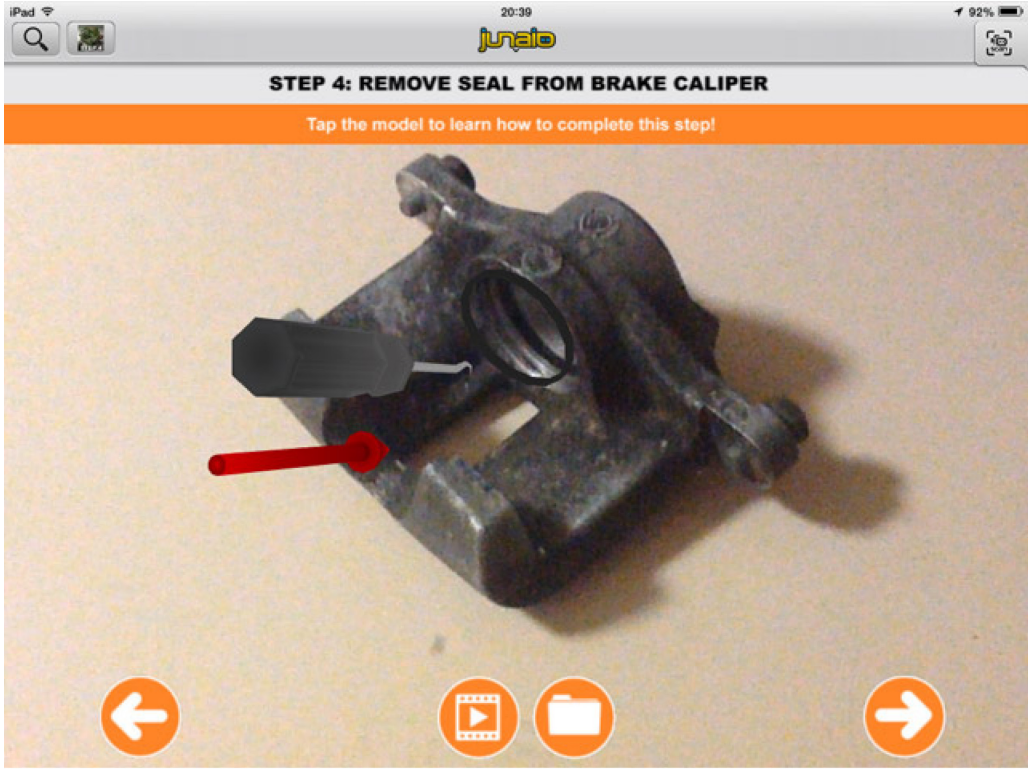
This screen instructs the learner how they're to position their brake caliper to enable the display of the augmented instruction for this step in the disassembly process.



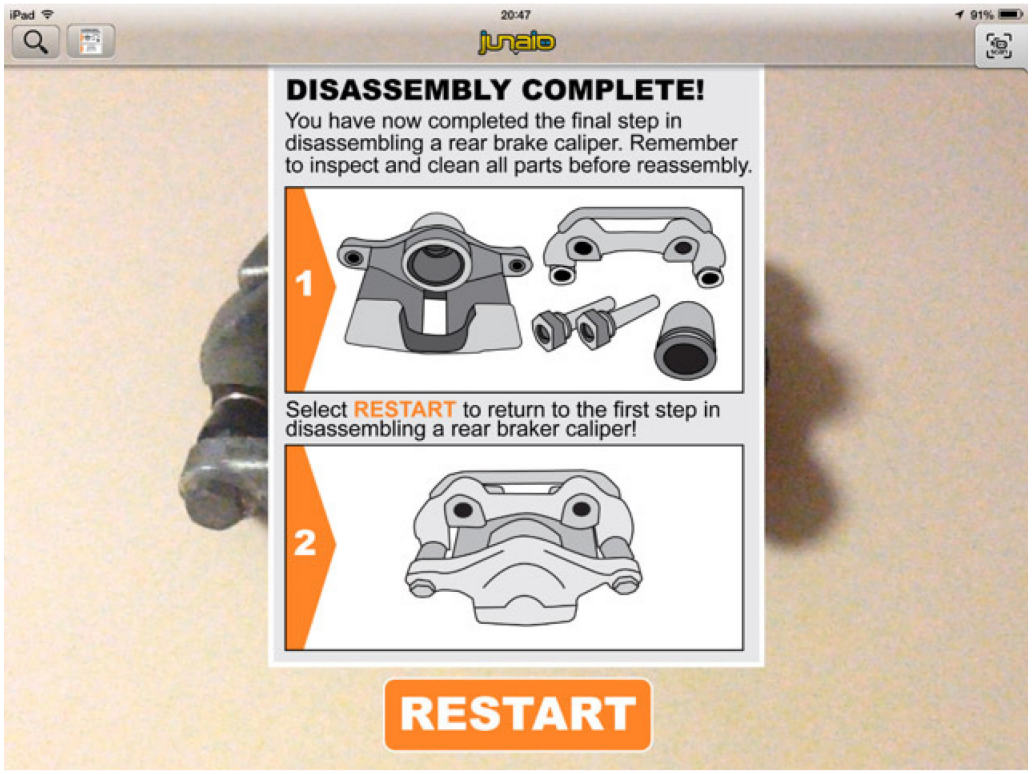
For this step, 3D geometry of an air tool and a directional arrow is placed over the rear brake caliper. Once the 3D geometry is tapped, an animation demonstrates how the tool is to be used to extract the piston from the brake caliper. The learner can then complete this step with their brake caliper.



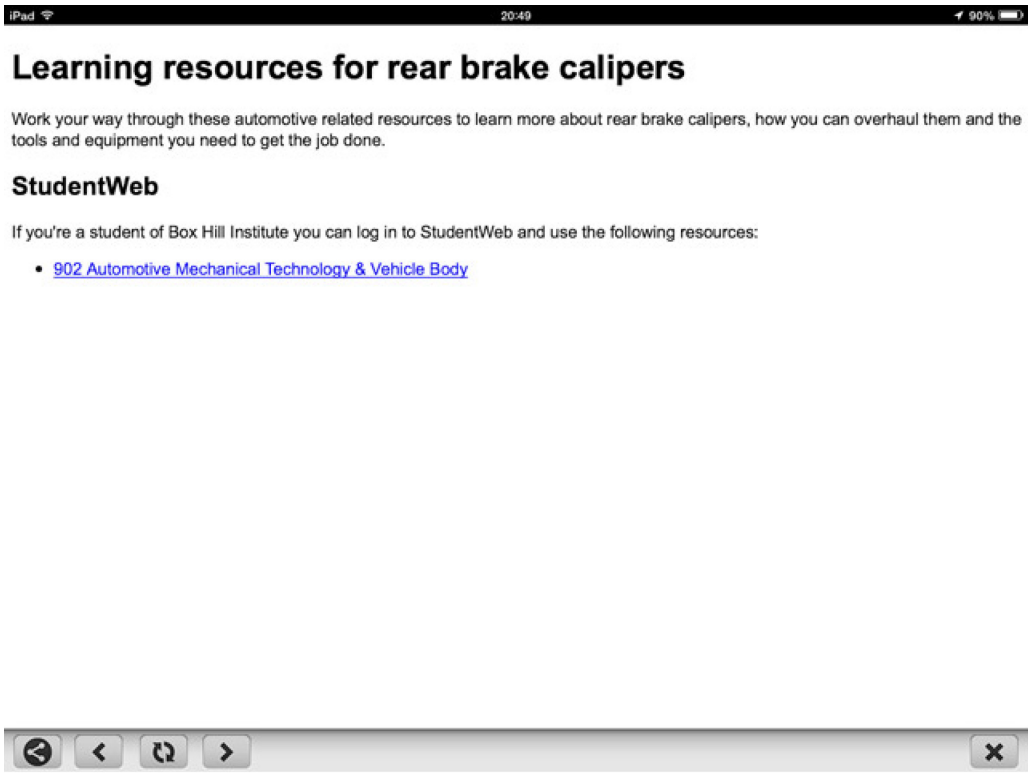
This screen instructs the learner how they're to position their brake caliper to enable the display of the augmented instruction for this step in the disassembly process.



For this step, 3D geometry of a pointed tool, directional arrow and piston seal is placed over the rear brake caliper. Once the 3D geometry is tapped, an animation demonstrates how the pointed tool is to be used to remove the seal from the caliper. The learner can then complete this step with their brake caliper.



This screen provides the learner with feedback on their status within the context of the augmented contextual instruction and their caliper disassembly experience.



iPad 20:49 90%

Learning resources for rear brake calipers

Work your way through these automotive related resources to learn more about rear brake calipers, how you can overhaul them and the tools and equipment you need to get the job done.

StudentWeb

If you're a student of Box Hill Institute you can log in to StudentWeb and use the following resources:

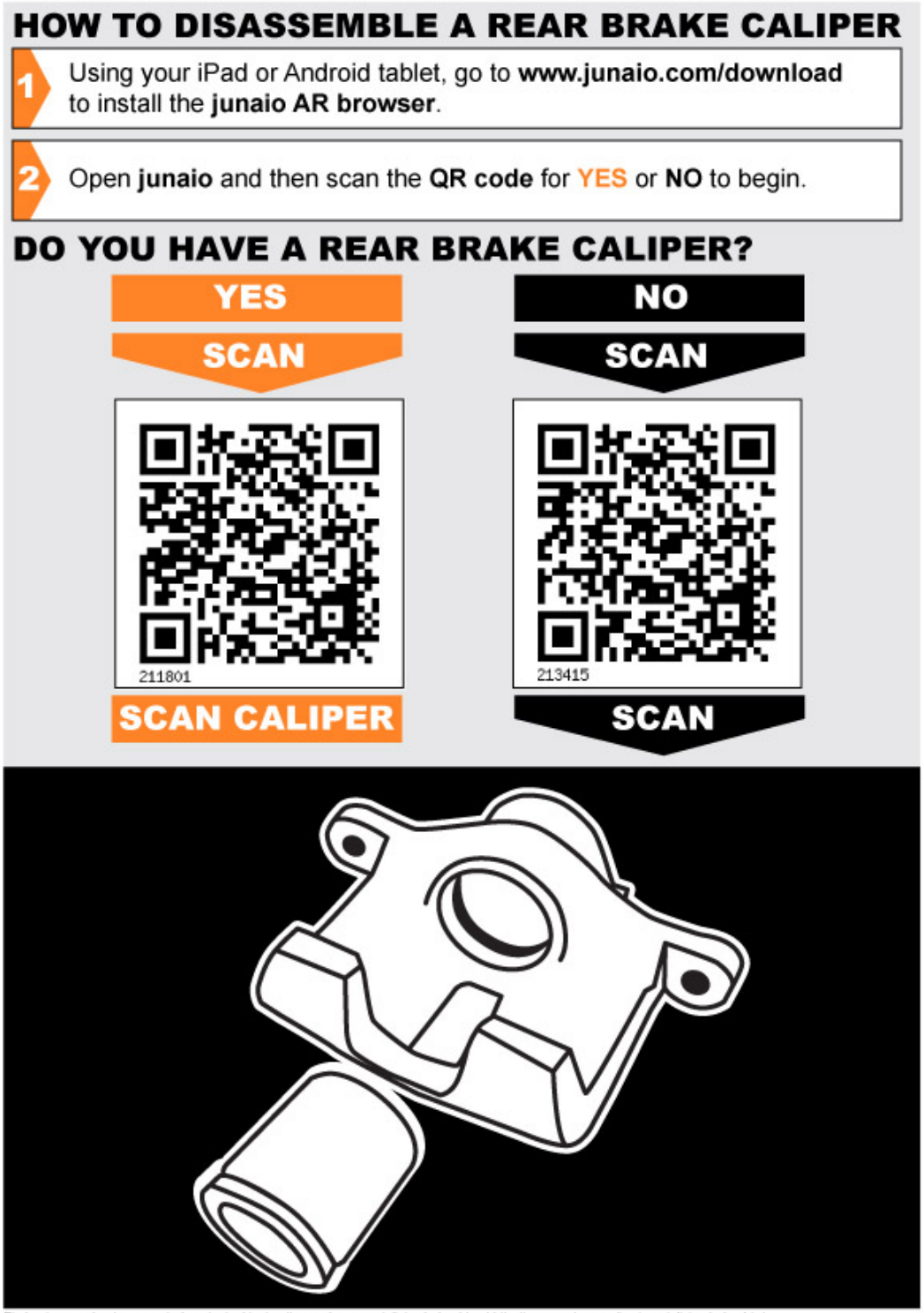
- 902 Automotive Mechanical Technology & Vehicle Body

A website with links to supplementary material can be accessed from within 'How to disassemble a rear brake caliper'. For this example, a Box Hill Institute specific link to StudentWeb was included. This website could easily be updated to include additional links to other online resources.

Step specific instructional videos streamed from YouTube can be accessed from within 'How to disassemble a rear brake caliper'.

Appendix D

This appendix contains the instructional poster that provides the learner with an entry point into the object-based or image-based augmented contextual instruction.



Find out more about augmented contextual instruction and my specialist scholarship at http://rowanpeter.com/tag/specialist-scholarship/

Appendix E

This appendix contains the session plan for the student trial for 'How to disassemble a rear brake caliper' that was conducted with automotive students.

Augmented contextual instruction - How to disassemble a rear brake caliper	
Course code	N/A
Date:	Thursday 21 November 2013
Time:	10:30 am to 11:00 am
Unit:	N/A
Trainers:	Rowan Peter (Blended eLearning Solutions at BHI)
Trainer's Signature	
Cohort	Automotive students and teachers
Centre Teachers	*Names removed*
Venue:	Automotive workshop at Elgar Campus
Pre delivery checks	Prepare and print publicity consent forms for students. Students under 18 will not be filmed or photographed. Install Junaio AR browser on all required iPads Gather rear brake calipers from automotive workshop Prepare and print instructional material for students to use during session
Enrolment	N/A
Outcome	By the end of the session the students will have: • worked their way through the process of disassembling a rear brake caliper with the assistance of augmented contextual instruction • learned about some of the important aspects and considerations of disassembling a rear brake caliper.

10:30 am (25 mins)	**How to disassemble a rear brake caliper** 1. Explanation and demonstration of features of augmented contextual instruction 2. Distribution of iPads and documentation 3. Students commence task 4. Students complete task of disassembling rear brake caliper.
10:55 am (5 mins)	**Following the task** Trial group complete survey and provide feedback on experience.

Appendix F

This appendix contains scans of all anonymous survey completed by students who participated in the student trial of 'How to disassemble a rear brake caliper'.

Survey

Thank you for taking part in the trial of 'How to disassemble a rear brake caliper' augmented contextual instruction and taking some time to complete this survey.

This survey does not require you to provide any personal information, but we are interested in your responses to the survey questions. Your views are important and will contribute to new features and improvements in future development of augmented contextual instruction and other augmented reality experiences.

How to complete the survey

For each question, circle **Yes** or **No** and then write additional response as required.

Question 1
Did you find the instruction in 'How to disassemble a rear brake caliper' easy to follow?

No/Yes

Why?

Because the instructions were not displayed as they were intended.

Question 2
Did you find it easy to move between watching the instructions on the iPad and completing the task?

Yes/No

If no, what did you find difficult?

Because nothing was clearly laged out.

Question 3
Would you prefer to have this activity on a hands-free device, such as Google Glass?

Yes/No

Question 4
Would the addition of audio instructions improve the experience?

Yes/No

Question 5
Would you like to be able to create your own augments to use as instruction for others? If yes, what would you do?

yes to complete complex tasks that are performed in ways you may not know how to go about them.

Question 6
How could this instruction be improved?

Better tracking and instruction

Survey

Thank you for taking part in the trial of 'How to disassemble a rear brake caliper' augmented contextual instruction and taking some time to complete this survey.

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How to complete the survey

For each question, circle **Yes** or **No** and then write additional response as required.

Question 1
Did you find the instruction in 'How to disassemble a rear brake caliper' easy to follow?

No/Yes

Why?

No. Because it was not clear on how to do it. Very ~~se~~ ~~se~~ scetchy

Question 2
Did you find it easy to move between watching the instructions on the iPad and completing the task?

Yes/No

If no, what did you find difficult?

No it was scetchy. and very hard to follow.

Question 3
Would you prefer to have this activity on a hands-free device, such as Google Glass?

Yes/No

Question 4
Would the addition of audio instructions improve the experience?

Yes/No

Question 5
Would you like to be able to create your own augments to use as instruction for others? If yes, what would you do?

No

Question 6
How could this instruction be improved?

~~clearer~~ Clearer, less movement of the animated objects. Update of software

Survey

Thank you for taking part in the trial of 'How to disassemble a rear brake caliper' augmented contextual instruction and taking some time to complete this survey.

This survey does not require you to provide any personal information, but we are interested in your responses to the survey questions. Your views are important and will contribute to new features and improvements in future development of augmented contextual instruction and other augmented reality experiences.

How to complete the survey

For each question, circle **Yes** or **No** and then write additional response as required.

Question 1

Did you find the instruction in 'How to disassemble a rear brake caliper' easy to follow?

No/Yes

Why?

Didnt work

Question 2

Did you find it easy to move between watching the instructions on the iPad and completing the task?

Yes/No

If no, what did you find difficult?

Didn't work

Question 3
Would you prefer to have this activity on a hands-free device, such as Google Glass?

Yes/No ?

Question 4
Would the addition of audio instructions improve the experience?

Yes/No

Question 5
Would you like to be able to create your own augments to use as instruction for others? If yes, what would you do?

NO

Question 6
How could this instruction be improved?

More stable tracking software

Survey

Thank you for taking part in the trial of 'How to disassemble a rear brake caliper' augmented contextual instruction and taking some time to complete this survey.

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How to complete the survey

For each question, circle **Yes** or **No** and then write additional response as required.

Question 1
Did you find the instruction in 'How to disassemble a rear brake caliper' easy to follow?

No/Yes

Why?

It did not work

Question 2
Did you find it easy to move between watching the instructions on the iPad and completing the task?

Yes/No

If no, what did you find difficult?

The fact it didn't work

Question 3
Would you prefer to have this activity on a hands-free device, such as Google Glass?

Yes/No

Question 4
Would the addition of audio instructions improve the experience?

Yes/No

Question 5
Would you like to be able to create your own augments to use as instruction for others? If yes, what would you do?

No

Question 6
How could this instruction be improved?

Maybe bring models that have been made for the ~~program~~ program

Survey

Thank you for taking part in the trial of 'How to disassemble a rear brake caliper' augmented contextual instruction and taking some time to complete this survey.

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How to complete the survey

For each question, circle **Yes** or **No** and then write additional response as required.

Question 1
Did you find the instruction in 'How to disassemble a rear brake caliper' easy to follow?

No/Yes

Why?

It was easy to follow because of the step by step instructions but it was unfortunate that the tracking was unsuccesfull

Question 2
Did you find it easy to move between watching the instructions on the iPad and completing the task?

Yes/No

If no, what did you find difficult?

It was difficult because it didn't really show the correct augmentation but the steps were correct

Question 3
Would you prefer to have this activity on a hands-free device, such as Google Glass?

Yes/No

Question 4
Would the addition of audio instructions improve the experience?

Yes/No

Question 5
Would you like to be able to create your own augments to use as instruction for others? If yes, what would you do?

Question 6
How could this instruction be improved?

The augmentations need to follow the object later utilising the tracker system.

Survey

Thank you for taking part in the trial of 'How to disassemble a rear brake caliper' augmented contextual instruction and taking some time to complete this survey.

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How to complete the survey

For each question, circle **Yes** or **No** and then write additional response as required.

Question 1
Did you find the instruction in 'How to disassemble a rear brake caliper' easy to follow?

No/Yes

Why?

IT WAS RIGHT INFRONT OF ME AND I COUID READ THEM

Question 2
Did you find it easy to move between watching the instructions on the iPad and completing the task?

Yes/No YES

If no, what did you find difficult?

Question 3
Would you prefer to have this activity on a hands-free device, such as Google Glass?

Yes/No

Question 4
Would the addition of audio instructions improve the experience?

Yes/No

Question 5
Would you like to be able to create your own augments to use as instruction for others? If yes, what would you do?

Question 6
How could this instruction be improved?

IMPROVE ON THE GRAPHICS AND THE LAYOUT OF THE APP ~~[illegible]~~ COUID BE MORE USER FRLENDIY

Survey

Thank you for taking part in the trial of 'How to disassemble a rear brake caliper' augmented contextual instruction and taking some time to complete this survey.

This survey does not require you to provide any personal information, but we are interested in your responses to the survey questions. Your views are important and will contribute to new features and improvements in future development of augmented contextual instruction and other augmented reality experiences.

How to complete the survey

For each question, circle **Yes** or **No** and then write additional response as required.

Question 1

Did you find the instruction in 'How to disassemble a rear brake caliper' easy to follow?

No/Yes

Why?

At some points yes and some points no. Buttons could be better labeled

Question 2

Did you find it easy to move between watching the instructions on the iPad and completing the task?

Yes/No

If no, what did you find difficult?

~~Yes~~ NO, the animations were confusing ~~to~~ ~~[illegible]~~ because the slightest movement gave the animations wild movements

Question 3
Would you prefer to have this activity on a hands-free device, such as Google Glass?

Yes/No

Question 4
Would the addition of audio instructions improve the experience?

Yes/No

Question 5
Would you like to be able to create your own augments to use as instruction for others? If yes, what would you do?

Question 6
How could this instruction be improved?

Survey

Thank you for taking part in the trial of 'How to disassemble a rear brake caliper' augmented contextual instruction and taking some time to complete this survey.

This survey does not require you to provide any personal information, but we are interested in your responses to the survey questions. Your views are important and will contribute to new features and improvements in future development of augmented contextual instruction and other augmented reality experiences.

How to complete the survey

For each question, circle **Yes** or **No** and then write additional response as required.

Question 1

Did you find the instruction in 'How to disassemble a rear brake caliper' easy to follow?

No/Yes

Why?

cause it was easy to follow but does need some development.

Question 2

Did you find it easy to move between watching the instructions on the iPad and completing the task?

Yes/No

If no, what did you find difficult?

Question 3
Would you prefer to have this activity on a hands-free device, such as Google Glass?

Yes/No

Question 4
Would the addition of audio instructions improve the experience?

Yes/No

Question 5
Would you like to be able to create your own augments to use as instruction for others? If yes, what would you do?

Question 6
How could this instruction be improved?

Survey

Thank you for taking part in the trial of 'How to disassemble a rear brake caliper' augmented contextual instruction and taking some time to complete this survey.

This survey does not require you to provide any personal information, but we are interested in your responses to the survey questions. Your views are important and will contribute to new features and improvements in future development of augmented contextual instruction and other augmented reality experiences.

How to complete the survey

For each question, circle **Yes** or **No** and then write additional response as required.

Question 1
Did you find the instruction in 'How to disassemble a rear brake caliper' easy to follow?

No/Yes

Why?

Yes, the instructions were easy to follow, basic intrustouctions layed out on a ~~big~~ A4 sheet.

Question 2
Did you find it easy to move between watching the instructions on the iPad and completing the task?

Yes/No

If no, what did you find difficult?

Yes, it was easy to move around even though I dont use the Apple system alot

Question 3
Would you prefer to have this activity on a hands-free device, such as Google Glass?

Yes/No

Question 4
Would the addition of audio instructions improve the experience?

Yes/No

Question 5
Would you like to be able to create your own augments to use as instruction for others? If yes, what would you do?

Yes this would be great, however would be hard to.

Question 6
How could this instruction be improved?

It seems to be in its early stages of actually using it however in the future this could revolutionise the way we teach and learn ourselfs in all industries.

Survey

Thank you for taking part in the trial of 'How to disassemble a rear brake caliper' augmented contextual instruction and taking some time to complete this survey.

This survey does not require you to provide any personal information, but we are interested in your responses to the survey questions. Your views are important and will contribute to new features and improvements in future development of augmented contextual instruction and other augmented reality experiences.

How to complete the survey

For each question, circle **Yes** or **No** and then write additional response as required.

Question 1
Did you find the instruction in 'How to disassemble a rear brake caliper' easy to follow?

No/Yes

Why?

did not work properly only had picture instruction not step by step wording

Question 2
Did you find it easy to move between watching the instructions on the iPad and completing the task?

Yes/No

If no, what did you find difficult?

Ipad too big no stand or somewhere to place for easy access to task and controlling the Ipad

Question 3
Would you prefer to have this activity on a hands-free device, such as Google Glass?

Yes/No

Question 4
Would the addition of audio instructions improve the experience?

Yes/No To some extent

Question 5
Would you like to be able to create your own augments to use as instruction for others? If yes, what would you do?

Increase instructions given with audio and sentence instructions

Question 6
How could this instruction be improved?

Read above

Appendix G

This appendix contains a list of links to photographs, blog posts and pages that document my Specialist Scholarship experience and the different stages of development for 'How to disassemble a rear brake caliper' augmented contextual instruction.

Summary of the Specialist Scholarship program

- http://rowanpeter.com/specialist-scholarship-2013/

Summary of Specialist Scholarship formal events

- Event 1 http://rowanpeter.com/amidoinitrite/vet-development-centre-specialist-scholarship-event-1-induction/
- Event 2 http://rowanpeter.com/amidoinitrite/vet-development-centre-specialist-scholarship-event-2-professional-development/
- Event 3 http://rowanpeter.com/amidoinitrite/vet-development-centre-specialist-scholarship-event-3-knowledge-sharing/

Blog posts related to the Specialist Scholarship

- http://rowanpeter.com/tag/specialist-scholarship/

Blog posts related to ongoing development activities

- http://rowanpeter.com/tag/ongoing-activities/

Blog posts related to problems and problem solving

- http://rowanpeter.com/tag/problems/
- http://rowanpeter.com/tag/problem-solving/

Blog posts related to early AR experiments and formative self-directed learning

- http://rowanpeter.com/tag/ar-experiments/

ARcamp 2.0 set on Flickr

- http://www.flickr.com/photos/rowan_peter/sets/72157633537467946/with/8755357407/

VET Development Centre: Specialist Scholarship set on Flickr

- http://www.flickr.com/photos/rowan_peter/sets/72157632951454095/