Supplement to the

AACTS project
final report

detailing the development of CRITICA a digital tool to support the development of Critical thinking skills.

Critica: open source output from the AACTS project
Funded by the National Teaching Fellowship Project Grant Scheme.
Executive summary
The initial aims of this project were to explore a technology-based pedagogic approach designed to enhance a student’s ability to discriminate effectively in their use of online resources. However, data obtained in the project suggested criteria for effective discrimination of web-based resources was not approached in a consistent manner by staff or students within or across disciplines. This data effectively challenged many assumptions made about the development of critical thinking skills in higher education and led us to question the validity of web-based tools designed to guide critical appraisal. Therefore, based on data obtained, the project refocused on the challenges of developing student’s critical thinking skills both from the perspective of the student and the lecturer.

Our overall approach was to understand student and staff perceptions of sourcing authoritative sources of information online and exploring how students used them to inform their assessment artefacts. In addition we explored students’ preferences for different modes of assessment. We also carried out an international Delphi-style study on faculty perceptions of critical thinking and tried to gain a consensus across disciplines. This work enabled us to develop a framework which identified the key skills which need to be developed to enable critical thinking. The framework, along with a web-based tool called the WRAP (web-resource appraisal platform) provided the information an scaffolding for the development of a self-authoring tool (AACTS – Authentic Assessment for Critical Thinking Skills) designed to support the development of student’s critical thinking skills and their application in their assessment tasks. This part of the project was undertaken by two Master’s students in computing, one of which continued the project as part of his PhD studies.

As a result of our research we found that students preferred to ‘do what their teacher told them to do’ and in general, did not have any understanding of the role of systematic searching in providing authoritative resources. We also found that staff perceptions of critical thinking skills were at best contradictory and at worst, non-existent. Our work also throws some interesting light on the practice of enthusiasts who produce tools that are quickly overtaken by the technological revolution, which seems to continue to gather pace by the minute. The AACTS tool, whilst functional was not user friendly in its design and did not meet our ambitions. The HEA allowed us an extension to employ consultants to develop the tool further. In reality, they took a completely different approach which is the focus of this supplement which details the design and developmental process and project management undertaken, the specification of the tool, the project assets and links to the tool itself.
# Contents

Executive summary .................................................................................................................. 2  
Scoping and planning the new tool .......................................................................................... 5  
  Project management .............................................................................................................. 5  
Applying Agile to the digital tool build ................................................................................... 8  
  Roles ...................................................................................................................................... 8  
  Tools ...................................................................................................................................... 8  
  Meetings ................................................................................................................................. 8  
  Sprints .................................................................................................................................... 9  
Specification for the tool ......................................................................................................... 10  
Research Data Used to Inform Tool Development .................................................................. 10  
  Overall summary .................................................................................................................. 10  
  The Market ............................................................................................................................. 11  
  Target audience ..................................................................................................................... 11  
  Recommendations ............................................................................................................... 11  
Technical specification ........................................................................................................... 16  
Final Project Scope .................................................................................................................. 17  
  Content Strategy .................................................................................................................... 18  
Technical Audit ....................................................................................................................... 19  
Critica Creative Concept ......................................................................................................... 20  
  Colour scheme and layout .................................................................................................... 20  
  Critica design templates ...................................................................................................... 23  
  Student dashboard ................................................................................................................. 23  
  Critical Thinking Six Stage Model Assets ........................................................................... 24  
  Logos, fonts, colours ............................................................................................................ 25  
  Main Framework Colours ..................................................................................................... 25  
  Section Colours ................................................................................................................... 25  
Infographic ................................................................................................................................ 26  
CRITICA – Prototype Programming ....................................................................................... 26  
Financial Statement .................................................................................................................. 27  
Summation ................................................................................................................................. 27  
  Additional dissemination ....................................................................................................... 27  
Appendix 1. Proposed specification for the AACTs tool .......................................................... 28
<table>
<thead>
<tr>
<th>Appendix 2 Critica Personas</th>
<th>.................................................................</th>
<th>33</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appendix 3: Online Questionnaire</td>
<td>.................................................................................</td>
<td>34</td>
</tr>
<tr>
<td>Summary of evaluation survey</td>
<td>..................................................................................</td>
<td>35</td>
</tr>
<tr>
<td>Informed Consent for the AACTs project tool design stage 2</td>
<td>.................................................................</td>
<td>37</td>
</tr>
<tr>
<td>Appendix 4: CRITICA example content</td>
<td>.................................................................................</td>
<td>38</td>
</tr>
<tr>
<td>Module: Basic practical Immunology</td>
<td>..................................................................................</td>
<td>45</td>
</tr>
<tr>
<td>Module: Learning and teaching</td>
<td>..................................................................................</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>..................................................................................</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>..................................................................................</td>
<td>49</td>
</tr>
</tbody>
</table>
Scoping and planning the new tool

Raida Ltd., were engaged as the consultants for this part of the AACTS project and were led by Principal Lecturer Karen Cham from Kingston University, London. The following were the issues addressed in scoping and planning the project.

- Project Management approach and project timing
- Interpreting the brief and identifying the purpose of this project
- Research: identify what users need based upon the existing research to produce a research report and recommendations.
- Requirements list
- Task analysis
- Competitor analysis based upon the existing research
- Technical audit and scope
- Scope of Work
- Creative concept development
- Design spec and style guide
- Information Architecture & structure
- User profiles
- User journeys
- Research: Concept evaluation using click-throughs and deliver research report and recommendations
- Content development
- Full technical scope
- Wireframes / sketches for prototype
- Design templates
- Assets
- Programming / Build for prototype
- Research: evaluating designs / prototype and deliver research report and recommendations

The following were the elements undertaken in the final build of the tool:

- Programming / build - for launch
- Usability evaluation

The development team, which included past and current Kingston University London postgraduate students took a user-centred design approach to developing the digital design proposal and a technical build using the key research findings from the AACTS project. They aimed to establish a best practice precedent by developing a tool that could receive maximum adoption across the target user groups, including staff and students involved in critical practice across all disciplines.

Project management

The team used an agile project management approach. Agile is an “umbrella term” for iterative, incremental software development methodologies which include: Extreme Programming (XP), Scrum, Crystal, Lean, Feature-driven development (FDD) and Dynamic Systems Development Method (DSDM). Agile methodologies emphasize: small teams delivering small increments of working software with great frequency while working in close collaboration with the customer and adapting to changing requirements.
Key attributes of agile:

- Promotes sustainable development
- Constant feedback
- Customer collaboration
- Iterative development
- Co-located dedicated teams
- Daily communications
- Resolve defects early
- Self-organizing teams – team members take ownership

Primary measure of progress: delivering working software frequently

**Scrum**

Scrum is the most widely recognized agile framework for the iterative development of software. It is comprised of a series of short iterations – called sprints (each sprint ends with the delivery of an increment of working software)

Scrum roles:

- Product owner (Stakeholder representative – priority setting, “business side”, control budget, sets strategy and direction, accepts/rejects the work for the sprint)
- Development team (Product creators – programmers, UI experts, testers etc. Cross functional skill sets, self-organizing and self-managing, ideally full time and co-located.
- Scrum Master (project facilitator – supports the team, removes obstacles, Scrum artifacts:
  - Product road map – overall view of Product requirements
  - Product backlog – list of all user stories associated with the project (main source for project requirements)
  - Sprint backlog – list of users stories associated with the current sprint, includes estimates in hours to complete tasks (max time should be one day per task)
  - Increment – the sum of all the product backlog items completed during a sprint and all previous sprints

Scrum user stories are a simple description of a product requirement which:

- Outlines the test case(s) for developers
- Can form that basis of automated testing
- Stakeholders have direct input – “Customer collaboration” Scrum meetings:

A sprint is a consistent iteration of time (1-4 weeks) which comprises:

- Sprint planning – beginning of the cycle, select the work to be done (turn user stories into tasks – detail time and work estimates)
- Daily scrum - ~15min – Coordination-not problem solving (what did you do yesterday, what are you planning today, any impediments/stumbling blocks?)
- Sprint review – Demonstrate the working product
- Sprint retrospect – Post mortem done after every sprint (what went well, what would we like to change, how can we make the change?)
A glossary of scrum terms can be found here: [https://www.scrum.org/Resources/Scrum-Glossary](https://www.scrum.org/Resources/Scrum-Glossary)
Applying Agile to the digital tool build

## Roles

<table>
<thead>
<tr>
<th>Name</th>
<th>Role</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lesley-Jane Eales Reynolds</td>
<td>Product owner</td>
<td><a href="mailto:L.Eales-Reynolds@kingston.ac.uk">L.Eales-Reynolds@kingston.ac.uk</a></td>
</tr>
<tr>
<td>Colin Clarke</td>
<td>Product owner</td>
<td><a href="mailto:c.clarke@kingston.ac.uk">c.clarke@kingston.ac.uk</a></td>
</tr>
<tr>
<td>Karen Cham</td>
<td>Project manager</td>
<td><a href="mailto:K.Cham@kingston.ac.uk">K.Cham@kingston.ac.uk</a></td>
</tr>
<tr>
<td>Raida Shakiry</td>
<td>UX director</td>
<td><a href="mailto:raida-shakiry@kingston.ac.uk">raida-shakiry@kingston.ac.uk</a></td>
</tr>
<tr>
<td>Crystal Hinam</td>
<td>UX designer</td>
<td><a href="mailto:k1356636@kingston.ac.uk">k1356636@kingston.ac.uk</a></td>
</tr>
<tr>
<td>Suzy Willis</td>
<td>UX designer</td>
<td><a href="mailto:k0312402@kingston.ac.uk">k0312402@kingston.ac.uk</a></td>
</tr>
<tr>
<td>Mari Barreddo</td>
<td>Scrum Master</td>
<td><a href="mailto:mari.barredo@gmail.com">mari.barredo@gmail.com</a></td>
</tr>
<tr>
<td>Douglas Tarasconi</td>
<td>Designer</td>
<td><a href="mailto:dtarasco@gmail.com">dtarasco@gmail.com</a></td>
</tr>
</tbody>
</table>

## Tools

**Basecamp** - [https://basecamp.com/2496564/](https://basecamp.com/2496564/)

Basecamp was used to start discussions, store files and share ideas between the complete project team.

**Pivotal Tracker** - [https://www.pivotaltracker.com/signin](https://www.pivotaltracker.com/signin)

Pivotal Tracker was used as the central tool for managing stories for the delivery of the AACTS project.

**Google hangouts** was used for group general remote communication

## Meetings

<table>
<thead>
<tr>
<th>Meeting</th>
<th>Description</th>
<th>Participants</th>
<th>Frequency</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kick-off Meeting</td>
<td>A kick-off meeting includes the roles of and contributions from the stakeholders. It also mentions the risks and issues involved, particularly those that may affect project schedules and lead to decreased customer satisfaction.</td>
<td>Stakeholders</td>
<td>Beginning of the project</td>
<td>1h</td>
</tr>
</tbody>
</table>
| Sprint Planning Meeting      | At the beginning of the sprint cycle, a “Sprint planning meeting” is held:  
- Select what work is to be done  
- Turn user stories into tasks  
- Prepare the Sprint Backlog that details the time it will take to do that work, with the entire team  
- Identify and communicate how much of the work is likely to be done during the current sprint  
Meeting divided in 2 parts:  
- (1st part) Entire team: dialog for prioritizing the Product Backlog  
- (2nd part) Development Team: hashing out a plan for the Sprint, resulting in the Sprint Backlog | SM, PO and Team       | Fortnightly     | 1-2 hours  |
| Sprint Review Meeting | At the Sprint Review Meeting:  
| - Review the work that was completed and the planned work that was not completed  
| - Present the completed work to the stakeholders (a.k.a. "the demo")  
| - Incomplete work cannot be demonstrated | SM, PO and Team | Fortnightly | 1 hour |
|----------------------|--------------------------------------------------|
| Sprint Retrospective Meeting | The Sprint Retrospective is intended to answer 2 fundamental questions:  
| - What went well during the last Sprint that we continue doing?  
| - What could we do differently to improve? The meeting is usually facilitated by the Scrum Master who will also take notes. The meeting must end with a list of action items that have been agreed upon and that will be implemented. | SM and Team | Fortnightly | 30 min |

**Sprints**

The length of sprints was decided with the whole team (including the technical team). Owing to the short time for release of Phase 1 of the product, it was decided the team would have shorter sprints (1-2 weeks)

**Sprint 0 – Strategic planning & scoping**  6-31 Jan 2014

**Key Milestones**

| Interpreting the brief and identifying the purpose of this project |
| Competitor analysis based upon the existing research |
| Research: identify what users need based upon the existing research to produce a research report and recommendations. |
| List of requirements |
| Task analysis |
| Scope of Work |
| Technical audit and scope |
| Timing plan |

**Sprints 1 & 2 – Design**  4-27 Feb 2014

**Key Milestones**

| Creative concept development |
| Produce a design spec and style guide |
| Develop Information Architecture & structure |
| Develop key user profiles, user scenarios and user journeys |
| Research: Concept evaluation using click-throughs and deliver research report and recommendations |
| Content development |
| Develop full technical scope |

The project team agreed to split up the Design milestone into two sprints, aiming to have consistency with the length of the sprints throughout the project (2 weeks). However, because half-term fell in February and some key project members were not be available during that time, the following was agreed:
• A short sprint of 1 week (4\textsuperscript{th}-13\textsuperscript{th} February 2014)
• A two-week sprint (13-25\textsuperscript{th} February 2014)

**Sprints 3 & 4 – Development** 4 -31 Mar 2014

**Key Milestones**

| Develop wireframes / sketches for prototype |
| Create design templates |
| Create assets |
| Programming / Build for prototype |
| Research: evaluating designs / prototype and deliver research report and recommendations |

**Sprints 5 & 6 – Production / Final build** 1 – 30 Apr 2014

**Key Milestones**

| Programming / build - for launch |
| Usability evaluation and Q&A testing |
| Final delivery - Go Live |

**Specification for the tool**

In order to enable the creative and technical team to develop a new tool, the project owners (Clarke and Eales-Reynolds) provided a specification for the tool that detailed the expected threshold capabilities (Appendix 1). Using this specification and the research data provided, the development team created a tool which achieved the aims of the specification in a user friendly way.

**Research Data Used to Inform Tool Development**

Following meetings with the project owners, receiving their functional specification and the AACTS project data relevant to the development, the project team explored the data to identify what could be developed in order to meet the project brief.

**Overall summary**

Students need to learn and practice critical thinking skills in preparation for employment post University. Presently there is a gap in the market for an interactive tool of this nature. The tool should be accessed online, students currently use the internet to gather information rather than their tutor or course content, with 67% of undergraduate and postgraduate students choosing the internet as their preferential source to discover most recent developments in area of study according to discipline (AACTS project data, Eales-Reynolds and Clarke). The findings from the data analysis resulted in the development of a series of ‘ personas’ detailing different user journeys (Appendix 2).
The Market
There is a huge resource of critical thinking material available online but very little that supports the use of authoritative material by both peers and tutors. Most online tools available, such as ‘TregEd: SCAN’, ‘The Critical Thinking Company’ and ‘Hogan Lovells’ offer online exercises where users answer questions, most using multiple choice, some allow moderation, but there is a lack of interactivity and functionality is limited.

Target audience
The target market is wide ranging including students, academics and administrators. The student market includes both undergraduate and postgraduate students and the tool needs to accommodate this through customization and the ability to add suitable content and resources.

Teachers / Academics will use the tool to set tasks for students/groups of students. Administrators will have the authority to enroll both staff and students on modules.

A further target audience are those who will tools as University ‘trusted resources’.

Recommendations
Students need to be encouraged to interact with content which explains and enables them to practice the different elements of critical thinking. The tool will do this as part of the student assessment artefact, allowing explanation of the artefact, how it should be constructed, and how it will be assessed. Rather than simply learning about critical thinking or answering questions, students will be encouraged to practice their skills.

Teachers / Academics can set tasks, upload resources, moderate and assess work by students and peer groups. Administrators can view detailed usage analytics.

The table following summarizes the analysis undertaken by the project team in respect of what the tool would need to encompass, afford and enable.
<table>
<thead>
<tr>
<th>Audience</th>
<th>Section</th>
<th>Sub-section</th>
<th>Description</th>
<th>External users</th>
<th>Priorit y</th>
<th>Phas e</th>
<th>Internal users - Update content</th>
<th>Internal users - Use Content</th>
<th>Type</th>
<th>Source</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher</td>
<td>Critical Thinking (CT) Self tests</td>
<td>??</td>
<td>Critical thinking self tests, guidance for producing assessment artefact, student selection, resources, assessment (learning objectives, assessment criteria, suggested)</td>
<td>Student</td>
<td>High</td>
<td>??</td>
<td>Teachers can update information, students linked to module informed of update</td>
<td>Teachers not informed of CT completion?</td>
<td>Text, video, images</td>
<td>AACTS, links, resources</td>
<td></td>
</tr>
<tr>
<td>Teacher</td>
<td>Group Tasks Section</td>
<td>Module Creation</td>
<td>Teacher creates group task by assigning students</td>
<td>Student</td>
<td>High</td>
<td>??</td>
<td>Teachers can select students using University numbers and assign them to groups/tasks</td>
<td>Students will be able to discuss and mark each other's work</td>
<td>Text, video, images</td>
<td>AACTS</td>
<td></td>
</tr>
<tr>
<td>Teacher / Student</td>
<td>Discussion and Assessment Section</td>
<td>Submitted work</td>
<td>Formative and summative assessment feedback and discussion.</td>
<td>Student</td>
<td>High</td>
<td>??</td>
<td>Teachers and peers can provide feedback, add comments and discussion</td>
<td>Read feedback and/or comments</td>
<td>Text, video, images</td>
<td>AACTS, links - external</td>
<td>Teachers and students informed by email when a comment is added or edited. Discussion allowed before work submitted?</td>
</tr>
<tr>
<td>Teacher / Student</td>
<td>Notification</td>
<td>Submitted work</td>
<td>Email notification when new material is added, assessment has taken place, new comments and discussion</td>
<td>Student</td>
<td>High</td>
<td>??</td>
<td>Ability to turn off/on notifications</td>
<td>Read notification in email software with link to content</td>
<td>Text</td>
<td>AACTS assessment feedback</td>
<td>Turnitin may be incorporated in the software. Ensure if this is needed. Deadline will be set and submission is required.</td>
</tr>
<tr>
<td>Student</td>
<td>Submission</td>
<td>Assessment material</td>
<td>Student work reviewed and submitted for marking / feedback</td>
<td>Student</td>
<td>High</td>
<td>??</td>
<td>Once work is submitted editing is disabled</td>
<td>Teachers/Administrators can view, mark and provide</td>
<td>Text, video, images</td>
<td>AACTS, Turnitin - ?</td>
<td>Marks out of 10 or percentage (overall and/or per section) could give students a guide to</td>
</tr>
<tr>
<td>Teacher</td>
<td>Marking</td>
<td>Assessment Material</td>
<td>Marking student submissions</td>
<td>High</td>
<td>??</td>
<td>??</td>
<td>Ability to provide mark for student work</td>
<td>Teacher can give guidance through a</td>
<td>Text</td>
<td>AACTS, Turnitin - ?</td>
<td></td>
</tr>
<tr>
<td>Administrato r / Teacher</td>
<td>Submission Log</td>
<td>??</td>
<td>Administrator / Teacher: View log of work submitted</td>
<td>High</td>
<td>??</td>
<td>Administrators / Teachers can see an overview of submissions with dates and</td>
<td>Text</td>
<td>AACTS</td>
<td></td>
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</tr>
<tr>
<td>Administrato r / Teacher / Student</td>
<td>Overview – Dashboard Control Panel</td>
<td>Overview of activity - modules and tasks created/associated with, highlighting ‘unread’ comments/submissions</td>
<td>Medium</td>
<td>??</td>
<td>Administrator / Teacher / Student use the overview screen to show activity.</td>
<td>Administrator / Teacher / Student can click on links to go to relevant</td>
<td>Text</td>
<td>AACTS</td>
<td></td>
<td></td>
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</tbody>
</table>

Check list could be incorporated so teachers don’t miss anything.
<table>
<thead>
<tr>
<th>Sub-task</th>
<th>Help - Information</th>
<th>Login - Dashboard</th>
<th>Task Creation</th>
<th>Discussion</th>
<th>Group Task - Peer Assessment</th>
<th>Final Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario:</td>
<td>Teacher / Student registers and logs in to AACTS for the first time</td>
<td>Teacher/Student/Administrator needs to login and see a dashboard with relevant details for user</td>
<td>Teacher needs to create a group task for a laboratory research study and writing up.</td>
<td>Student has a query about CT exercises</td>
<td>Student has been supplied a peer assignment to mark/provide feedback</td>
<td>Students submit final project teacher assessment</td>
</tr>
<tr>
<td>Applies to:</td>
<td>Teacher / Student</td>
<td>Teacher/Student/Administrator</td>
<td>Teacher</td>
<td>Teacher / Student</td>
<td>Student / Peer Students / Teacher</td>
<td>Students / Teacher</td>
</tr>
<tr>
<td>Influencers:</td>
<td>Guidance and instructions on how to use tool.</td>
<td>Modules working on/associated with, assessment, submission</td>
<td>Critical thinking self tests, guidance for producing assessment artefact, student selection, resources, assessment (learning objectives, assessment criteria, suggested resources and tools)</td>
<td>Time consuming for teachers</td>
<td>Guided feedback, pre-marking instructions</td>
<td>Submission through AACTS or Turnitin, plagiarism check, receipt of submission</td>
</tr>
<tr>
<td>Task completion barriers:</td>
<td>If video used, could be costly and time consuming. Users will want to use tool straight away.</td>
<td>Each user will have a different view</td>
<td>Ensuring students know how it works and what to do</td>
<td>Could be time consuming for teachers</td>
<td>Feedback may not be helpful and could be hurtful.</td>
<td>Problems when uploading final files - file size, incompatibility, final deadline cut off point</td>
</tr>
<tr>
<td>Function:</td>
<td>Guidance viewed When user logs in, instructions will need to be read/viewed.</td>
<td>Login / Register Create account using university details and password creation</td>
<td>Insertion of Critical Thinking exercises Text, images, links, video</td>
<td>Question asked by student Question/s submitted in designated area. Question can be visited and re-read / edited.</td>
<td>Distribute project for peer feedback amongst students Using student numbers. Based on student capability?</td>
<td>File/s submitted File/s uploaded with cover note for teacher</td>
</tr>
<tr>
<td>Teacher Content</td>
<td>Administrator Content When a Administrators will see an overview of activity, details of users, modules.</td>
<td>Assessment artefact Guidance / Brief with information, links, embedded video and relevant resources</td>
<td>Teacher notification Teacher notified of student questions</td>
<td>Notification Students notified when a peer project is available to mark</td>
<td>Submission receipt Students notified project has been submitted successfully</td>
<td></td>
</tr>
<tr>
<td>Teacher Content Teachers will see module/s associated with, task/s</td>
<td>Student selection Using student numbers</td>
<td>Teacher responds to question Teacher responds in designated are</td>
<td>Students view peer project Un-selectable / Un-savable</td>
<td>Teacher notification Teacher notified of student submission</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student Content Students will see modules they are registered with.</td>
<td>Resource inclusion Links to content</td>
<td>Student notification Student notified of teacher response</td>
<td>Mark project Provide mark - out of ten/percentage</td>
<td>Marking Teacher marks project and provides feedback</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Links</td>
<td>Assessment method selection Peer review including date and final review including date and time</td>
<td>Student reads comment/s Student reads comment. Comment marked as read</td>
<td>Submit feedback/mark Project available for author</td>
<td>Student notification Student notified that mark and feedback available to view</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Launch and deadline date submission Start and cut off points</td>
<td>Teacher moderation of feedback Teacher can read comments to check suitability and allow/dis-allow submission</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task duplication</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
## Tool Benchmarking - competitor analysis

<table>
<thead>
<tr>
<th>Site Criteria / Category</th>
<th>AACTS</th>
<th>Tregoed</th>
<th>The Critical Thinking Company</th>
<th>Graduates Hogan Lovells</th>
<th>Major Tests</th>
<th>California Critical Thinking Skills Test (CCTST)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usability</td>
<td>1</td>
<td>3</td>
<td>3</td>
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## Students

<table>
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<tr>
<th>Category</th>
<th>AACTS</th>
<th>Tregoed</th>
<th>The Critical Thinking Company</th>
<th>Graduates Hogan Lovells</th>
<th>Major Tests</th>
<th>California Critical Thinking Skills Test (CCTST)</th>
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<td>(logged in)</td>
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<td></td>
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<tr>
<td>Tool Help/Guidance</td>
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<td>2</td>
<td>1</td>
<td>1</td>
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<td></td>
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</tbody>
</table>
The California Critical Thinking Skills Test is widely used in the United States and is based on the Facione study. However, the questionnaire and analysis are not publically accessible and there has been considerable argument about its efficacy as a tool to measure critical thinking in students.

**Technical specification**

The scope of this project was to create an early stage digital learning tool that encourages critical thinking. This tool will be cloud based. The tool will be designed and built to be extended to millions of students and thousands of institutions. As a result, design decisions will have scalability in mind.

The digital tool will have its own webserver built in order for it to be easy to deploy on most current Linux servers. The tool will be written in the clojure programming language for the backend which

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<table>
<thead>
<tr>
<th>Category</th>
<th>Teachers/Academics</th>
<th>Administrators</th>
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</thead>
<tbody>
<tr>
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<tr>
<td>Assessment</td>
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<td>3</td>
</tr>
<tr>
<td>Overview Dashboard</td>
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</table>

<table>
<thead>
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<th>Teachers/Academics</th>
<th>Administrators</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Registration</td>
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</tr>
<tr>
<td></td>
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<td></td>
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<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Tool Help / Guidance</td>
<td>1</td>
</tr>
</tbody>
</table>
runs on the JVM and will be dependent on java7 and javascript for the front end.

**User access**

Each user will need to login using a user id and password to login to the system. Different users will have custom views i.e. Students will see courses they have signed up for and it's content, Lecturers will view all courses they are teaching as well as the associated analytics and Department Heads will see all courses and analytics.

**Database**

This system has the ability to run in a distributed matter and as a result has a scalable database that is able to handle data larger than can be stored on one server also known as 'Big Data'. Due to the time-based analytics needed, the database implemented is time series based. As a result, the Cassandra NoSql database has been used for this project, [http://en.wikipedia.org/wiki/Apache_Cassandra](http://en.wikipedia.org/wiki/Apache_Cassandra).

Cassandra is an open source database that is used by Facebook, Ebay, Netflix and many others to manage their large volumes of data and associated analytics. It has been proven in high stress production environments over the last few years as being stable and efficient. It is also proven to manage time series very well and is able to run analytics in a distributed fashion.

**Content of courses**

The tool will be HTML5 based in order to integrate video, text and img contents seamlessly.

**Final Project Scope**

As a result of analyzing the data supplied and undertaking market analysis, the project team developed the following proposal for the scope of the project.

To design, develop and build a prototype that focuses upon manifesting the core mechanic of engendering critical thinking that can be applied to a variety of disciplines. For phase 1, the development will focus on three disciplines as case studies including Nursing, Heritage and Education. The prototype will be developed aimed at the target group of entry level undergraduates and it will be optimised for tablets. The tool will be designed and developed to meet the needs of each of the target user groups:

**Students:** The tool will need to meet the needs of both undergraduate and postgraduate students.
Therefore, content will reflect this and will need to be personalized with the ability to add suitable / relevant content and resources. This information will be provided with the tool at 4 levels (academic Level 4 – 1st year; Level 5; Level 6 and Level 7 – Masters level). The tool will be designed to engage the Students to encourage / persuade them to interact with the content, to practice their Critical Thinking skills and to share with peers and teachers to get feedback.

**Teachers / Academics:** The tool will be developed to enable Teachers / Academics to set tasks for students / groups of students, upload resources, provide feedback, moderate and assess work by students and peer groups.

**Administrators:** The tool will be developed to enable Administrators to view detailed usage analytics.

The client’s key requirements for the redesigned AACTS tool include:

1. Password protected (linked to university ID),
2. Have an explicit pedagogical foundation,
3. Deliver an engaging user centered experience,
4. Enable academics to easily customize the tool and assessment artifact to align with student and disciplinary needs,
5. Provide structured guidance for the development of students’ ability to think critically,
6. Facilitate the provision of feedback to students as they develop critical thinking and on their assessment artifacts,
7. Include indicative links to relevant academic sources and the ability moderate/ change these,
8. Provide a user friendly solution for collating evidence and note taking
9. Include the provision for linking to Turnitin.

**Content Strategy**
The content of the tool falls into two distinct areas:

1. Guidance for developing critical thinking i.e. various exercises using internal and external (to the tool) sources for developing critical thinking - these should be able to be switched on and off by the academic to tailor the content for different academic levels.

2. Space for uploading/importing project/problem information that will form the foundation of an authentic assessment.
**Technical Audit**

Critica is an early stage cloud based critical learning tool commissioned by Kingston University for the purpose of enabling the application of critical learning skills to online teaching. The software is designed as a MOOC, massive online learning course, meaning it would need to facilitate and manage the education of potentially thousands of students at the same time. In order to be able manage the process of teaching so many students the tool was designed with scalability in mind from the start.

Critica’s back end infrastructure is written in the Clojure programming language which is a functional programming language on the JVM. Some clojurescript and javascript were used to create a dynamic front end.

The tool is HTML5-based in order to integrate video and other content seamlessly. Bootstrap styling was used to ensure that the site was responsive for different screen sizes. In deployment the tool can be deployed on any cloud infrastructure using a jar file which includes a webserver as well as all necessary dependencies.

The database used is Cassandra which is a scalable NoSql datastore used by the likes of Facebook and Netflix. Cassandra is a highly scalable distributed database that can handle ‘big data’.

**Installing**

The platform can be installed and run in a linux server with the following tools pre installed: git, cassandra (the database), java, leinengen. The code takes care of automatically downloading from the hosted repositories the dependencies it needs when it’s run.

**Updating**

All updates are conducted through git, a version control system.
**Critica Creative Concept**

**Scope:** To develop a digital tool that engenders critical thinking as a core cognitive practice for a variety of disciplines, that is developed from the findings of the AACTS research project. This tool uses use Faciones six stage model of critical thinking as an architecture for teaching, learning and assessment:

1. Interpretation
2. Analysis
3. Evaluation
4. Inference
5. Explanation
6. Meta cognition

We intend to evaluate this model by undertaking NeuroUX testing of competitor tools and this tool as part of its iterative development, to generate quantitative data on engagement by design. We will integrate a number of key functionalities to enable the systems to evolve through use and provide meta on that use for research purposes.

During development, visual mock-ups were created based on the research informed ‘personas’ created by the team (Appendix 2). These and the associated maps were used to help the designers come up with the colour scheme and proposed layouts. These were then tested in relation to two other CT skills based sites – Tredego and the Californian Critical Thinking Skills Test Site through a questionnaire (Appendix 3—including ethical approval)

**Colour scheme and layout**

The following series of images demonstrate the design stages that were considered for the tool. As a result of the testing and surveying carried out, the specific colour schemes and fonts were chosen for the tool, details of which are included in the following pages along with the developed assets.
Critica design templates

Student dashboard
Critical Thinking Six Stage Model Assets
advancing critical thinking skills

Main Framework Colours

Section Colours

1. Interpretation   Interpretation   R:202 G:198 B:163
2. Information Seeking  Information seeking  R:250 G:166 B:26
3. Explanation     Explanation     R: 79 G:191 B:165
5. Inference      Inference      R:237 G:160 B:207
Infographic

An infographic has been added to the CRITICA homepage explaining “the six stage concept of Critical Thinking” concept: http://functional.guru/index.html

CRITICA – Prototype Programming

Feature list:

- Login and Sign up facility with password security hashing
- Task creation and management for each module
- Task completion and peer to reviews of tasks for students
- Student dashboard with notifications and commenting as per wireframe
- Marking or liking of tasks by lecturers and other students. Facility to report abuse in case of inappropriate commenting
- Analytics of site usage based on web click.
- Hosting of prototype for testing by participants.
Financial Statement
The detailed final financial statement is included at Appendix 5.

Summation
The foregoing clearly demonstrates the tremendous work that the team have undertaken in only four months to achieve a testable and shareable product. Whilst we will be continuing to test and develop the tool, this has been developed as a result of the research undertaken in the AACTS project and has resulted in a tool that is intuitive and highly usable. I dynamically adjusts to the format of the device being used and enables the collection of a rich database of material for further study. The project team have purchased the domain www.critica.ac.uk which is being hosted by Kingston University London. The acquisition and configuring of the domain is currently being completed and the site will be migrated in June from the current hosted service. We expect the site to be live for demonstration at the Higher Education Academy conference in June.

Additional dissemination


Appendix 1. Proposed specification for the AACTs tool.

AACTs stands for Authentic Assessment for Critical Thinking Skills. Employers claim that graduates do not have transferable critical thinking skills which they require. A theoretical underpinning for Higher Education is that assessment drives learning and if it relates to something that the student might expect to undertake in the ‘real world’, then that learning is increased. Such an authentic assessment artefact might be producing an exhibition catalogue for a student in museum studies, creating an exhibition of work that demonstrates criticality in its interpretation of the subject for a student in photography, carrying out a laboratory research study and writing up the outcomes as a paper for publication for bioscience students. We can teach students critical thinking skills and we can help them understand what we would be looking for in their assessment, but we also need to help them understand how to construct those artefacts. So, if we are to teach students CT skills, we need to do so through encouraging them to practice those skills and use them appropriately in the production of an assessment artefact.

In simple terms, the tool needs to allow students to interact with content which explains and enables them to practice the different elements of critical thinking. The tool must also explain what the artefact is, how they should construct it and how it will be assessed.

In order to achieve this, the student needs to be able to access the tool, revisit their work, share it with peers and teachers to get feedback on their draft work. In addition, teachers need to be able to choose which elements they wish to include, be able to edit some elements and be able to provide feedback. They should also be able to assign students to groups for group work and so there would need to be an
asynchronous system to allow student-student and student-teacher interaction.

We envisage this working as a web-based front end (which should be as fully SCORM compliant as possible and which should be able to be embedded within the major learning environments such as Moodle and Blackboard. I would need to be supported by a back-end database.

To avoid confusion, we have provided a glossary of terms used within this document.

We envisage there to be 2 components to the system, the front end and the back-end database.

Within the front end, we envisage a landing page beneath which are three 3 different perspectives:

1. Administrators front end
2. Teachers front end
3. Student front end

The landing page will provide general information about the tool and the funding that has supported its development. I will then have a register or login option

‘Registration’ : The teacher must be able to register themselves on the system (this would be admin enabled/approved). Once registered, their name would be associated with the Teachers front end so that on subsequent visits when they click log in they would see the teachers front end.

Modules should be populated with students automatically, so student registration would be about linking their student ID and password with the student front end.

Teachers Front end

‘Log in’ : The teacher should be able to login and automatically see the teacher front end.

‘Module’ : A teacher may be associated with more than one module and any module may have more than one teacher associated with it.

‘add a module’ this would need to be via the module name and number – ideally this would link to SITs to enable automatic population with students who are registered on that module. Each module may have 1 or more tasks associated with it.

‘select a module’ : The teacher must be able to revisit a module with tasks underdevelopment or with completed tasks to access information about submissions, completions, feedback etc that will be associated with each task.
‘Task’ A task is an assessment artefact. Each module may have many formative assessment artefacts and may have more than one summative artefact.

‘Create new task’: This is where the teacher would choose the elements to be included for the students, add information about the assessment artefact, decide on whether or not it is a group task and assign students to groups, decide which type of feedback is appropriate, choose resources to be provided, choose if assessment is within tool or to be submitted through Turnitin, and decide if asynchronous chat should be enabled.

‘Review a task’ – this enables the teacher to see the student view of the task to check all the appropriate elements are present and accessible.

‘Publish a task’ – this then allows the task to be visible to students who will be on the programme. Once this has occurred, no change to the content is allowed but staff must be able to import and export files for comment and feedback.

‘Guidance page’ This should be a tab accessible to all teachers giving advice about how to use the tool.

Once the task is ‘live’, the teacher needs to be able to undertake the following activities

1. Be able to see log in statistics and completion for the CT element of the task
2. Need to know when students have submitted work for formative feedback – an email alert system (?)
3. Submission log for task (the same task may be submitted on several occasions for formative and summative assessment). Log needs to include date and a link to the artefact for commenting also needs to log when students are sent feedback and provide email alert (?) for student that feedback is available.
4. Be able to see any formative work including any peer feedback where applicable
5. Summative assessment would be through Turnitin where applicable or through the tool. Need to know when and there needs to be a cut off deadline that prevents late submission. Log of student ID and date of submission.
6. Access to artefacts for assessment and feedback (at formative and summative stage). At summative stage this would be through Turnitin for many or through the tool where necessary.

Students Front End
‘Log in’ Students registered on a module should automatically be populated in the database from SITS using student ID. Students will need to log in so that entered data and self-testing outcomes can be directed to right student. Log on should be via student ID and a password that they create (they will need to register this at first log in).

On logging in, students have a landing page for their front end which gives an explanation of the tool and the option to choose the module. (Students may be registered on more than one module that is using the tool).

When the module page opens there will be various tabs which the lecturer determine how the student works through them. They have to sequentially complete the CT section the first time through, including the self-tests. Subsequent runs through allows students to choose which elements they look at. So the tabs will be Critical Thinking, Task, Feedback.

Critical Thinking - This tab takes students to a landing page and a series of connected pages that provide information and exercises (self-test) that let them develop and practice their critical thinking skills. This information will be provided with the tool at 4 levels (academic Level 4 – 1st year; Level 5; Level 6 and Level 7 –Masters level). The teacher will dictate which set of information is provided for the module and the task and how the student must work through it –i.e. they can choose where they start or they must work sequentially through everything until complete. Students can revisit this tab and so if there is a forced sequence, the tool will need to remember where the student is in this section and return them to that point. Once they have completed the whole section they can revisit it at the landing page and choose where they go in the section. (Probably through the use of tabs for each sub-tab)

Task – the tab will take students to a landing page which gives information about the task, the learning objectives, the assessment criteria, suggested resources and tools. It may also identify a series of sub-tasks that students must complete before progressing to the next. Completion of each sub-task produces an artefact (a word document, an .avi; a .pdf; a set of images) which students must upload for teacher and or peer feedback.

Output tab which lists all the artefacts a student has uploaded. The student must be able to download these for revision or development (towards summative feedback) and to read feedback on the work. The teacher and/or peers (where peer feedback is enabled by the teacher) should be able to also see these based on the student ID. They (teachers and peers) need to be able to open the file in situ with a comments box ( or boxes for peer feedback) in order to provide formative and summative feedback.
They should also be able to download and upload the files if the artefact is such that they can provide direct feedback (e.g. wordfile). Each module may have more than one task associated with it – if the tool requires release order on a date basis stipulated by the teacher, then there is no requirement for a step allowing the student to choose the task. Could be eliminated when the student chooses the module. It would be down to the lecturer to enable the release date on a task so that only one is available at any time. Final submission of the assessment task may be through the outputs tab although KUL rules require electronic submission and feedback through Turnitin. However, some artefacts may not be able to be submitted through Turnitin – this must be clear in the information/advice given to students at the start of the task. These artefacts will be downloaded by the teacher as above but must have a deadline date for final submission and a log of student ID and date submitted. This log should include all sub-task submissions and dates of feedback provided.

**Feedback**: this tab allows students to see their feedback but there should be an email or other ‘alert’ to the student providing a link and date of when the feedback was provided.

**Advice tab** – this will be a set of pages that just provide information about the tool and how to use it.
Appendix 2 Critica Personas

Sarah Bryant
Persona type: Undergraduate Student
Name: Sarah Bryant
Age: 21
Course: Adult Nursing (BN)
Location: London
Technical Comfort: High

About Sarah
Sarah is in the third year of her ‘Adult Nursing’ course and is looking to gain a first degree with honours. Sarah lives with friends in a house share close to university, she spends her free time studying in the university library or at home on her laptop computer. When undertaking course research Sarah firstly uses the internet to gather information from websites and online resources.

Motivations
- Practise Critical Thinking skills in order to improve writing skills for her dissertation.
- Gain peer and tutor feedback to improve coursework before final submission.
- Improve Critical Thinking skills to prepare for employment post university.

Experience Goals
- Access AACTS anywhere - out and about, at home, in university, ‘on the go’ and on multiple devices.
- Locate/revisit module and peer and tutor feedback as and when required.
- Quick loading time, don’t want to wait for pages to load.

Frustrations
- Dislikes reading instructions, wants to use software immediately.
- Short patience/attention span, don’t want to wait for pages to load or software to open.

Ideal Experience
- An easy to use, attractive user interface and experience.
- The ability to access and revisit AACTS as and when required on multiple devices.
User journey design for persona: SARAH BRYANT

### Persona type
University Lecturer

### Name
Ian Bransbury

### Age
43

### Course
BA (Hons) Secondary English Education with QTS

### Location
Lancashire

### Technical Comfort
Medium

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**About Ian**

Ian has been teaching Secondary Education for 15 years, and has been employed at Edge Hill University, Lancashire for 8 of those years. Ian is used to his planning and teaching methods and is dubious about learning new software because his technical comfort isn't strong, but he is open minded if he can see the benefits for his students.

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**Motivations**

- Allow students' Critical Thinking Skills to be improved in their own time, in order to help when taught in lectures.
- Assigning peer feedback helps students improve their own work and can improve and encourage working in a team.

**Experience Goals**

- Easily monitor if/when students have provided peer feedback & submitted work.
- Monitor students' progress & give feedback.
- Access help on CT and tool usage.
- Provide formative feedback to students as they are developing their skills and artefacts.
- Construct assessment briefs.

**Frustrations**

- Way of time and effort needed to learn how to use new software and introduce this to students.
- Software/technical skills are not strong.

**Ideal Experience**

- An easy to use, attractive user interface and experience.
- Good tutorials/guidance within tool to aid students in reducing teaching time.
**User Scenario**

Janine Langford is a University secretary and hopes the WCTP tool will improve student engagement and retention. A better tracking system enables an individual benefit in improved staff efficiency, whilst also providing learning points. The WCTP tool systems will support more than one for feedback on student learning.

**User Journey**

**Persona type:** Administrator

**Name:** Janine Langford

**Age:** 36

**Course:** Course Administrator - School of Computing

**Location:** London

**Technical Comfort:** Medium

**About Janine**

Janine has worked in secretarial and other various administrative roles since leaving Comprehensive School with 3 A Levels grades A - C. Janine ensures the smooth running of Courses; this includes supporting the teaching of the courses by preparing documents, materials and rooms and providing secretarial and administrative support to other staff members.

**Motivations**

- Having up to date and effective software gives students and Lecturers a better experience and reflects well on the University.
- Wants an efficient tool that will improve courses and both students and Lecturers will enjoy using.

**Frustrations**

- Wary of time and effort needed to learn new software and introduce this to staff.
- Wont spend long accessing and analysing analytics, would like an easy overview.

**Experience Goals**

- Quickly and easily access usage analytics to keep track of effectiveness and popularity.
- Email/approve staff and students accounts.
- Set up/edit Lecturer & student permissions.
- Easily monitor students progress.
- Easily monitor development of Lecturers.
- Access the tool from home and University.

**Ideal Experience**

- An easy to use, attractive user interface for statistics/analytics overview.
- Good tutorials/guidance within tool to aid students and reduce teaching time.
Appendix 3: Online Questionnaire

The survey was created using Google Forms at the following address:
https://docs.google.com/forms/d/1omxFfhMV5e2UDxw6g-UfD5Ol0QgaGkh_t3wz7OkcME/viewform

One hundred and eighty one responses were obtained:

Participants percentages:

- Student 17%
- Academic staff 71%
- Administrative staff 12%

The comparator sites used were GMAT and SCAN.
Summary of evaluation survey

SCAN has a good visual/aesthetic design

![Pie chart showing responses]

Strongly agree  4  3%
Agree          47  30%
Neutral        42  27%
Disagree       47  30%
Strongly disagree  17  11%

SCAN has a good page layout.

![Pie chart showing responses]

Strongly agree  54  34%
Agree          54  34%
Neutral        53  34%
Disagree       35  22%
Strongly disagree  9  6%

Initial impression:
- Far too text based too much text/content
- Like the short scenarios as they often initiate discussion.
- It's simplistic style meant that I could focus on the text without distraction.
- I don't really understand it’s purpose, it's an awful lot of information on one page with no particular aim or concept. I don't find it particularly engaging just leaving relevant links to the lesson at the bottom of the page.

Likes:
- The fact that additional links were provided. Which allow you to use to alternative sources to get a better understand of the passage that you just read.
- The instructions are clear. The lesson and point of view are in logical order, it is clear what the user needs to do.
- The idea of engaging students with a text through choosing a point of view.

Dislikes:
- Too busy, and I am unsure about the focus of the activity.
- Large amount of text was used in the question and the answer that you required to provide as a response.
- Additional links - need some context - one line description for each of what they provide.
- Too much text with no hierarchy.
**GMAT has a good visual/aesthetic design.**

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<td>Strongly disagree</td>
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**GMAT has a good page layout.**

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<td>15%</td>
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<td>Strongly disagree</td>
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**Initial impression:**
- Interesting, with good simple design and good questions
- Looks a bit lengthy, and a little confusing.
- The layout is simple and clean but the page is too long due to the paragraph.
- Good layout and less cluttered.
- Good idea - tests seem varied but dislike the ads, which serve as a distraction.

**Likes:**
- The content and simple intuitive design.
- It’s clear and concise and looks easy to complete.
- Clarity is good. Questions and options are clearly stated without any confusion.
- Multiple choice, number of different tests, explanation of the test structure and option to view your scores.

**Dislikes:**
- Advertisement. No exam should have ads in it.
- The page it too long.
- Difficult to follow the written information due to layout around the pictures.
- Timed tests, which will put extra pressure on students.
- Too much text.
CRITICA has a good visual/aesthetic design.

- Clear structure and layout and that relevant information was displayed in date order.
- The way you can personalise it to suit your dept / school.
- Notifications shown and clear options down the side, visually not over crowded.
- Areas of screen clearly demarcated, navigation down left-hand side looks easy to find your way around.

CRITICA has a good page layout.

- Engagement - taking a point of view.
- The Title of each section.
- Clear, gives the student a visual application to undertake.
- The additional links
- Ability to choose a point of view but also to have the possibility to see the other points of view.
- Much nicer than the last page, brighter, more active.
- Looks more sociable, like an education facebook almost.

Dislikes
- I think that I would need more instructions on how to use or to work my way around the system by trial and error
- There isn't any real sense of order/flow.
- Information overload too much information for a single screen and far too much text.
- Lack of clear instruction.
- It's a bit busy. Not quite sure how all the boxes connect.
The CRITICA tool looks user friendly

- Strongly agree: 18 (12%)
- Agree: 74 (47%)
- Neutral: 41 (26%)
- Disagree: 18 (12%)
- Strongly disagree: 5 (3%)

The ability for Universities and Schools to personalise the interface

- Strongly agree: 48 (31%)
- Agree: 81 (53%)
- Neutral: 18 (12%)
- Disagree: 6 (4%)
- Strongly disagree: 1 (1%)

The CRITICA interface is clear and easy to understand

- Strongly agree: 12 (8%)
- Agree: 61 (39%)
- Neutral: 40 (26%)
- Disagree: 7 (5%)
- Strongly disagree: 12 (8%)

The ability to allow peer to peer feedback

- Strongly agree: 55 (35%)
- Agree: 78 (50%)
- Neutral: 20 (13%)
- Disagree: 3 (2%)
- Strongly disagree: 0 (0%)

The ability to allow tutor feedback

- Strongly agree: 61 (39%)
- Agree: 80 (51%)
- Neutral: 15 (10%)
- Disagree: 1 (1%)
- Strongly disagree: 0 (0%)

If available, I would use the CRITICA tool

- Strongly agree: 14 (9%)
- Agree: 42 (27%)
- Neutral: 72 (46%)
- Disagree: 22 (14%)
- Strongly disagree: 6 (4%)
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Assigning students to groups

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6 step process for developing CT

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View staff and student usage statistics

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Strongly agree 36 25%
Agree 77 53%
Neutral 28 18%
Disagree 3 2%
Strongly disagree 0 0%

Strongly agree 45 31%
Agree 82 57%
Neutral 16 11%
Disagree 0 0%
Strongly disagree 0 0%

Setting a deadline

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Using tool while commuting, which device?

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<th>Device</th>
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<td>Laptop</td>
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Whilst at University, which device?

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Informed Consent for the AACTs project tool design stage 2.

We are conducting a research project about supporting the development of critical thinking skills through the use of Web 2.0 technology. The project has been running for 3 years and we have a team developing a new version of the original AACTs tool. We want to make sure that it is acceptable in the way it looks to users. To this end we would like to ask you to look at three websites (http://tregoed.org/, http://www.insightassessment.com/Products/Products-Summary/Critical-Thinking-Skills-Tests/California-Critical-Thinking-Skills-Test-CCTST/(language)/eng-US and a mock up of the AACTs tool) and tell us:

What you like about each site
What you don’t like about each site
Which you like best and why

Please consider the layout, the functionality, the colour, print size etc.

You may either be asked to do this electronically (via email) or in person by one of the research team. You responses will be anonymous (we will only record if you are a student or a member of academic or administrative staff). Only the research team will see the data. Responses will be stored electronically on the project database to which only the project team have access.

This anonymous data may be used to inform our research and may be included in publications.

There is no compulsion for you to take part and the project team would like to thank you for considering our request.

If you are prepared to help us under these terms, please sign below and return this document with your responses.

Signature: ___________________________ Date: ____________________
Appendix 4: CRITICA example content

Module: Basic practical Immunology

Task:
In groups, you are required to find a solution to the problem described below. The final output from this work will be a written explanation of how you have solved the problem, the thinking that led you to this conclusion and why you believe your solution is the correct one. Also include how you think the study could have been improved. This problem requires you to use all the skills that comprise critical thinking.

Problem:
A hospital laboratory has been carrying out a study to determine how effective a new vaccine is. After appropriate ethical approval and gaining informed consent from patients, those receiving the vaccine donated a blood sample before being vaccinated, two weeks post vaccination and two weeks post boosting. The samples were stored in labelled trays (pre-, first post, second post vaccination) in a -20°C freezer until all samples had been collected. Just prior to the start of analysis of the samples, the freezer broke down and the samples had to be moved to back-up storage. At this time the trays were knocked over and all the samples mixed. Each tube merely had the patient number on it.

You are required to find a quick and inexpensive method for distinguishing between the 3 samples for each patient and then determine which method you would use to analyse the efficacy of the vaccine.

The following activities are designed to help you solve the problem but also to help you develop your critical thinking skills. You will have to work through the activities at least twice in order to address both parts of the problem.

Activity 1- Interpretation – understanding and ability to express meaning or significance

The first thing you need to do is interpret what you are being asked to do and ensure you understand it. Try doing this by asking questions that relate to the task. For example: 'What do I need to know to answer this question.' What is the study looking for? Use the blog space to share with your group these questions and any answers you may have. Look at and respond to the posts of your colleagues.

Now go to Activity 2 – Information seeking
Part 2 (From activity 3); Having evaluated your sources of information you need to use them to help build your knowledge of what happens when someone is vaccinated. Read them carefully and make sure you understand them. Ask yourself questions – ‘Do you understand the language used? Do you understand what is being described? Use your blog to share your interpretation with your colleagues and ask them if they agree with you.

Now go to Activity 4 Analysis

Activity 2- Information seeking-seek out relevant material to help develop your knowledge and understanding.
Once you think you know what you have to do, you need to find information that will help you to understand what happens when someone is vaccinated. Obviously you can try text books or undertake a websearch. Think carefully about the type of information you need and where you are likely to find that information. Share your thoughts on your blog, question your own approach and that of your group members. What comprises good information seeking behaviour? What parameters are you using to define your search? Share your ideas and the resources you have found with your group.

Now go to Activity 3 Evaluation

Part 2 (from Activity 6)
Having gained sufficient new knowledge and interpreted it in the light of the problem you need to solve, you now need to seek out information about the types of tests you can undertake to identify which sample is which. You will need to determine a quick and inexpensive way of identifying each sample and then a highly sensitive test to measure the responses. What information sources will you use? What will be your search criteria? Again, share your ideas with your group and question those of your colleagues.

Now go to Activity 5 - Inference

Activity 3- Evaluation – assess the credibility of statements etc.
Look at the information sources you have chosen. Are they valid sources of information? Explain in your blog why you believe that they are valid and have a look at what other group members are saying. Are the conclusions in your sources valid? Are they based on evidence? Have they made logical arguments?? If you are not sure, ask your group members through your blog.

Now go back to Activity 1
Activity 4- Analysis – identify intended and actual relationships between statements
You will need to use your powers of analysis to think about how the knowledge you have gained through your information sources relates to the problem you are trying to solve. To do this you need to ask yourself questions such as ‘How does vaccination cause the effects described in your information source and how does that help me solve the problem?’ Make sure that what the source is saying seems to follow logically. Share your analysis on your blog. Take a look at those of your group members and ask them questions if you don’t understand their analysis of what their information sources are telling them in the context of your problem
Now go to activity 5 - Inference

Activity 5: Inference – identify and secure elements needed to draw reasonable conclusions.
Using the knowledge you have gained about the cellular and biochemical responses to vaccination, you need to identify which information you can use to support your conclusions about what is happening and how that relates to you being able to solve the problem you have been asked to address. From the evidence you have found, what can you infer about the samples you need to identify? Why do you believe that your conclusions are correct? What might be the counter arguments to the conclusions you have drawn? How would you counter these arguments? Put your inferences on your blog and then see if anyone has presented different conclusions to you. Can you present a persuasive argument as to why you are correct and they are wrong?
Now go to Activity 6 Explanation

Part 2 (from Activity 3)
Having identified reliable information sources about the type of test you might use you need to consider the validity of the information provided and explore how it meets the conditions of the problem you are being asked to solve. Given the information you have found, what conclusions are you drawing about the texts you should undertake.
Now go to Activity 6 Explanation

Activity 6: Explanation- able to cogently present results of ones reasoning
Finally, on your blog, using all the information you have gained and the arguments you have presented, give a cogent (clear, well-reasoned) explanation of what you think the answer to the first part of the problem is. Explain your thinking and reasoning.
Now go back to Activity 2

Part 2 from activity 5 (Inference)
On your blog, describe the tests you are proposing to use and why. Give a clear explanation of your thinking behind your choice and present counter arguments to any alternative options that you may have identified but dismissed. Look at the postings of your colleagues and see if you agree with them and if not, offer your counter argument based on evidence you have found, your interpretation of that evidence and the task in hand.

Module: Learning and teaching
Task
As a group, you are required to find a solution to the problem described below. The final output from this work will be a written report explaining your solution to the problem, the thinking that led you to this conclusion and why you believe your solution is more appropriate than any other. Also include how you think the study could have been improved. This task requires you to use a set of skills and attributes that comprise critical thinking.

Problem
You are part of a teaching team who are presenting a new module on Miscarriages of Justice. This module has been designed to ensure that lecturers use an active learning approach to teaching. Each 2 hour classroom session uses a combination of multimedia presentations, case studies, and debates to develop students’ understanding of the multiple causes and explanations for miscarriages. However, the team has noticed that students are reluctant to engage during these sessions, particularly the discussions. Colleagues have reviewed the curriculum and the teaching styles of the team, without identifying a cause for students’ lack of engagement. Therefore the teaching team has been tasked to identify from the literature possible causes for this lack of engagement and a plan for developing student engagement in the remaining sessions.

The activities below are designed to help you develop you solve the problem whilst developing your critical thinking skills. You will need to work through the activities several times in order to examine different solutions to the problem and different perspectives. There are likely to be several solutions to this problem and you will need to justify the chosen solution(s)

Activity 1- Interpretation – understanding and ability to express meaning or significance.
The first thing you need to do is interpret what you are being asked to do and ensure you understand it. Try doing this by asking questions that relate to the task. For example: What do I need to know to answer this question? What is the study looking for? Use the blog space to share the questions and any answers you may have, with your group. Look at and respond to the posts of your colleagues.

Now go to Activity 2 – Information seeking
Part 2 (From activity 3)

Having evaluated your sources of information you need to use them to help build your knowledge of how to engage students in their own education. Read them carefully and make sure you understand them. Ask yourself questions – ‘Do you understand the language used? Do you understand what is being described? Consider using concept/ mind mapping to collate your thoughts. Use your blog to share your interpretation with your colleagues and ask them whether or not they agree with you.

Now go to Activity 4 Analysis

Activity 2- Information seeking - seek out relevant material to help develop your knowledge and understanding.

Once you think you know what you have to do, you need to find information that will help you to understand what is meant by ‘engagement’ in an educational setting. Obviously you can try the library or undertake a web search for scholarly articles or guidance from professional teaching organisations e.g. the Higher Education Academy or SEDA. Think carefully about the type of information you need and where you are likely to find that information. Share your thoughts on your blog, question your own approach and that of your group members. What comprises good information seeking behaviour? What parameters are you using to define your search? Share your ideas and the resources you have found with your group.

Now go to Activity 3 Evaluation

Part 2 (from Activity 6)

Having gained sufficient new knowledge and interpreted it in light of the lack of student engagement, you now need to seek out information concerning how to improve student engagement. You will need to determine the most effective changes to classroom practice for student engagement. Do perceptions of effective engagement strategies depend on whose perspective is being presented? What information sources will you use? What will be your search criteria? Again, share your ideas with your group and question those of your colleagues.

Now go to Activity 5 – Inference

Activity 3- Evaluation – assess the credibility of statements etc.

Look at the information sources you have chosen. Are they valid sources of information? Explain in your blog why you believe that they are valid and have a look at what other group members are saying. Are the conclusions in your sources valid? Are they based on evidence? Have they made logical arguments?? If you are not sure, ask your group members through your blog.

Now go back to Activity 1
Activity 4 - Analysis – identify intended and actual relationships between statements.
You will need to use your powers of analysis to think about how the knowledge you have gained through the information sources relates to the problem you are trying to solve. To do this you need to ask yourself questions such as: What causes are described in the information sources for the lack of student engagement and how does that help me solve the problem? Whose perspective does the research explore? Make sure that what the source is saying seems to follow logically. Share your analysis on your blog. Take a look at the analyses of your group members; ask them questions if you don’t understand their analysis in the context of student engagement.

Now go to activity 5 - Inference

Activity 5: Inference – identify and secure evidence needed to draw reasonable conclusions.
Using the knowledge you have gained about student engagement, you need to identify which information supports different solutions. Determine which solution supports your conclusions about why the team is experiencing poor student engagement and how that relates to solving the problem you have been asked to address. From the evidence you have found what can you infer about poor student engagement? Why do you believe that your conclusions are correct? What might be the opposing arguments to the conclusions you have drawn? How would you counter these arguments? Put your inferences on your blog and then see if anyone has presented different conclusions to you. Can you present a persuasive argument as to why you are correct and they are wrong?

Now go to Activity 6 Explanation

Part 2 (from Activity 2)
Having identified reliable information sources about the most effective changes to classroom practice for student engagement explore how they meet the problem you are being asked to solve. Given the information you have found, what conclusions are you drawing about the steps you should undertake.

Now go to Activity 6 Explanation

Activity 6: Explanation- able to cogently present results of ones reasoning.
On your blog, using all the information you have gained and the arguments you have presented, give a cogent (clear, well-reasoned) explanation of what you believe to be the lack of student engagement. Explain your thinking and reasoning.

Now go back to Activity 2
Part 2 from activity 5 (Inference)
On your blog, describe the changes to classroom practice that you are proposing to use, and why. Give a clear explanation of your thinking behind your choices and present counter arguments to any alternative options that you may have identified but dismissed. Look at the postings of your colleagues and see if you agree with them and if not, offer your counter argument based on evidence you have found, your interpretation of that evidence and the task in hand.

Activity 7 - Final output
Using the sources that the group have identified and the conclusions from the group’s blog posts put together a final blog entry in the form of a report to address the task and problem.