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DELIVERABLE Report

D3.5

Service scenario documentation

Version 3.0

JUXTALEARN

Juxtapositioned reflective performance
enabling science and technology learning
Grant Agreement No. 317964
collaborative project co-funded by the

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SUMMARY

The purpose of Deliverable 3.5 is to provide guidelines to creating juxtaposed performance, particularly to advise non-drama teachers on what to do and how to manage performance in stage 3 of the JuxtaLearn process. Building on pedagogies of threshold concepts and juxtaposed learning, it explains the performance steps, orchestrating learning through participative video making and story making with peers. It provides guidance for teachers, offering resources that include suggested lesson plans and example timings.

Thus, in the absence of a shared touchable with JuxtaLearn software, it suggests a practical additional and alternative to using the software of WP4 touch table.

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1. INTRODUCTION

1.1 Document Purpose and Scope

This deliverable builds on pedagogies of threshold concepts and juxtaposed learning pedagogy explained in Work Package 2 and draws on previous WP3 deliverables D3.1 Orchestration, D3.2 Framework, and D3.3. The service scenarios described in this document contribute to work-packages: WP4 Video Creation, WP5 Interactive Situated Displays, and WP6 Web space System and Learning Analytics and come from the use case workshops described in D3.4. They provide the practical palette documentation to create juxtaposed performances.

This document is divided into the following sections:

Section 1 “Introduction”: describes the purpose, structure and scope of this document.

Section 2 “Orchestrating juxtaposed performance”: documents the performance process for juxta learning, outlining the steps, timings, resources, where to obtain supporting assets such as videos and slides. It discusses orchestrating juxtaposed learning, and the practicalities of story making and performance.

Section 3: Story making”: this section explains the nature of a story and how to create one with the help of a story board.

Section 4: “Appendices”: this section provides resources for juxtaposing, story making, and creativity. It includes a section on use cases that describes various scenarios from observed cases. It also describes a case that explored only the development step when no touch table or filming technology was available.

1.2 List of Acronyms

CM	Catcher Media
CPP	Creative performance palette
ETA	Example Teaching Activity, previously referred to as <i>Standard Teaching Activity</i>
JLP	JuxtaLearn Learning Process
JPP	JuxtaLearn Performance Process
M1.....n	Month 1.....n of the JuxtaLearn project
PPP	Practical performance palette

STA	Standard Teaching Activity
WP	Work Package

2. ORCHESTRATING JUXTAPOSED PERFORMING

The JuxtaLearn performance process consists of a number of steps and centres mainly on stage 4, the perform stage within the JuxtaLearn process shown in Figure 1: JuxtaLearn process. This document provides guidance to the perform process for the steps before and during production: development, pre-production and production. The Compose, Share, Discuss and Review stages of the JuxtaLearn process handle the other generally accepted steps of post-production and of dissemination in WP4 and WP5. These steps are not discrete, but overlap and integrate with each other.

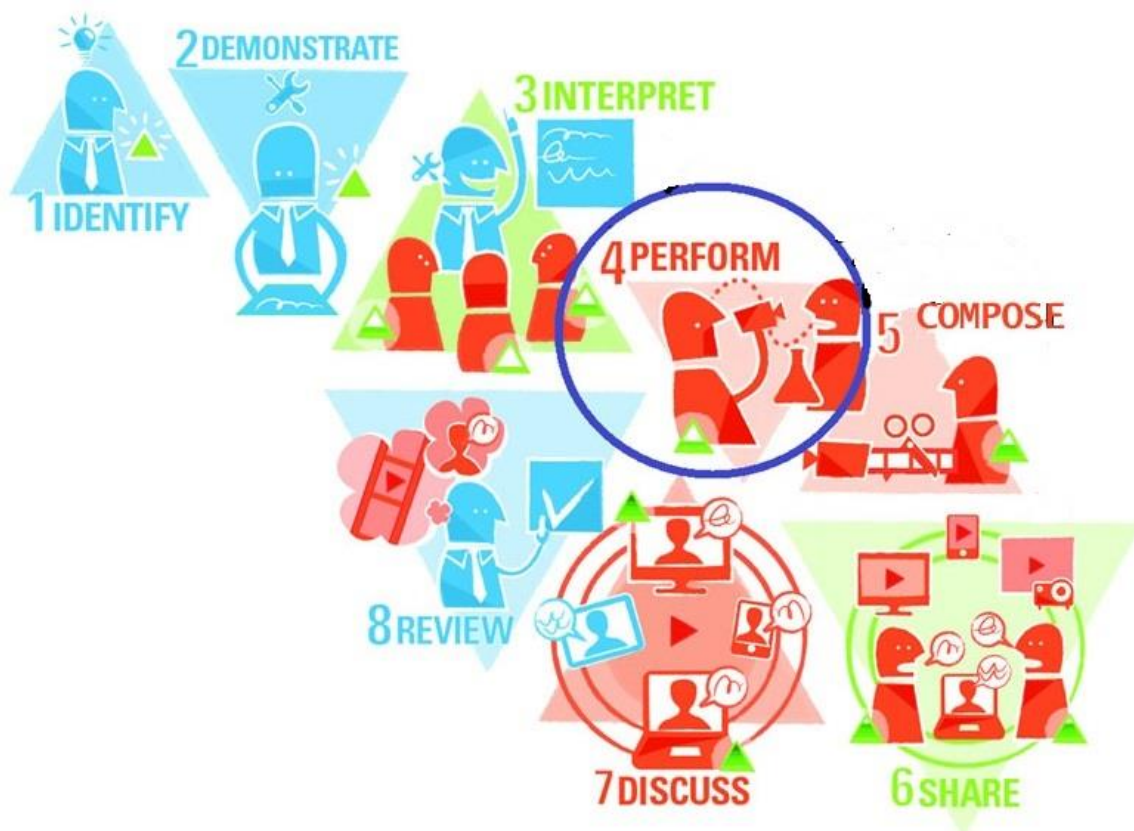


Figure 1: JuxtaLearn process

The first step in the perform process requires developing ideas, thus linking with the previous JuxtaLearn process stage, Interpret (WP2). Students must interpret their teacher’s activity, the example teaching activity (ETA). Having started to learn the topic, the students take an initial quiz that the teacher devises (See WP2) to identify stumbling blocks of the topic. The teacher also records answers. These activities verbalise and crystalize a teacher’s thought processes on questions (Clough, 2014a), and students find the activity useful before producing their own performance or presentation of the topic. During the performance steps, the teacher facilitates and guides the learning process (Clough, 2014b), for example, by demonstrating how the

visualization of their quiz results as a radar chart helps students diagnose and focus on their personal stumbling blocks.

2.1 Juxtaposed performance steps

The sequence of steps normally followed for filmmaking is **develop, pre-produce, produce, post-produce, share and upload and screen**, (shown in flow chart in the appendix on the performance process). The JuxtaLearn perform stage concentrates on the first three steps, i.e. develop, pre-produce, and perform. The most important of these from the juxtaposing for learning perspective is the develop step. **At development**, students must

1. Find characters in the topic
2. Build a scenario with characters and setting
3. Create the main character (protagonist)
4. Identify the task of the protagonist
5. Identify the obstacle to achieving that task
6. Work out how the character can achieve the task
7. Predict the outcome
8. Think of the story, picking an alternative scenario that can juxtapose with the topic
9. Draw cartoon pictures of
 - a. the main character,
 - b. the task of the character (protagonist)
 - c. who, what or where something helps in this task
 - d. what obstacle prevents achieving the task
 - e. how the protagonist achieves the task
 - f. the outcome
10. *Discuss the planned story with teacher to ascertain understanding of the topic*
11. Juxtapose the story with the teacher's presentation of the topic
12. Allocate roles and jobs
13. Write scripts. See example in Figure 5: dramatic script for performance
14. Video

The teacher's role is to observe and intervene to help the students with their understanding of the topic under study. See section on Guidance for teachers. For an example scenario that concentrated on the development step, see Use case of interpret and perform stages (two-hour session).

2.2 Guidance for teachers

This series of instructions guides teachers on the performance steps needed to prepare their students to produce their performance.

- A. Introduce the topic to the students
- B. Provide an ETA against which the students can juxtapose their performance.

- C. Tell the students their task is to develop and film a juxtaposed performance of their understanding on one of the stumbling blocks of the topic.
- D. Discuss with students what a story is.
- E. Show students slides of what a storyboard is (See Slides in resources for teachers),
- F. Show students slides on how to plan a story by creating a storyboard (See video available at <http://clipit.es/ou/explore/view/2480>). Also, show a more poorly juxtaposed performance (e.g. <http://clipit.es/landing/video/horse-jump-division/616>.) (See Videos in Resources for teachers).
- G. For **the development step**, if table top software is available let students use the touch table. Alternatively, give students paper copies of the storyboard template (See storyboard template in Resources for teachers).
- H. The teacher should have edited the storyboard to show the stumbling blocks on the left hand side.
- I. Provide creative prompts by offering the creative performance palette cards (See CPP cards in Resources for teachers).
- J. While the students are creating their storyboard, it is important that the teacher observe and intervene as needed in order to comment, advise and teach.
- K. For **the pre-production step**, provide students with creative equipment (See Creative equipment in Resources for teachers)
- L. For **the production step**, provide students with technical equipment (See Technical equipment in Resources for teachers).

For possible timings, see section on Suggested timetables. For examples of lesson plans, see Use cases.

2.3 Juxtaposed learning

Juxtaposing happens when you place two unlike ideas side by side, highlighting the differences between them. Learning happens during the process of juxtaposing, and includes playing and peer learning (Hovardas et al., Lazzari, 2009, Pegrum et al., 2015), the video being a means of creating, furthering discussion and sharing (Boud et al., 1999). The JuxtaLearn process requires that the teacher teach a topic, the students take an initial quiz (devised by the teacher), and then they create a performance, record it, watch and discuss it. Their performance should juxtapose with their teacher's presentation. The juxtaposition is in the performance. Technology further facilitates and enhances the process, for example in providing on line quizzes at the start and end of the process, or showing large screen displays of the performance to further and widen discussion.

The juxtaposition is between what the teacher presents and what the students perform, as implied in Table 1: juxtaposing teacher & student scenarios. Identifying a setting is usually simple; somewhere where the action takes place; somewhere that locates the topic, e.g. in a bell jar for molecular mass, or on a treasure island requiring calculation of steps to find treasure. Identifying a character is trickier. The character may be obvious, or too obvious, in being a human involved with the topic, such as Boyle in Boyle's law, Einstein in relativity, or Stanislavski when discussing dramatic naturalism and realism. However, a creative approach might find characters in a bowl of sugar lumps, a bell jar of moles or the 'equals' symbol of an equation.

Table 1: juxtaposing teacher & student scenarios

1. Teacher's scenario	2. A juxtaposed scenario
Identify setting of topic	Create a new setting
Work out what character there might be in the topic	Invent new characters in the new setting

Any constraints on creativity can make learning possible because they map out “a territory of structural possibilities” (Boden, 2003 p95), such as imposing syntactical constraints on coding computer programs, or grammatical constraints on writing a novel, or musical constraints on tonality or a limited number of characters in a Twitter posting.

2.4 Orchestrating learning through peer learning

Peer learning combined with individual study allows students to benefit from discussion of the stumbling block under study, problem solving activities, and epistemic conflict (Butera, 2010). Epistemic conflict, when students disagree over the meaning of a concept allows students to argue with and explain to each other (Alpay et al., 2010, Butera, 2010). For example, at a composing workshop where students were writing their script about division, one student who did not want to do the voice-over offered to write down what another told her, explaining, “I don't know how to like explain it ... I can write it down. I can't explain it. Tell me what to say.” Another student dictated the script for the voice-over.

Participation itself is not enough to ensure learning. Because this is group work, students may have difficulties with group dynamics (including relational conflict). An example of this happened with some students who created a video about called ‘Horse jump division’. In a group of five, three girls worked together creating the visual aspects of the video, and two others sat apart, not participating; neither sub-group talked about the mathematics. The resulting video, whilst showing some visual creativity does not juxtapose the storyline with the mathematics that the students were stumbling over and it is not clear that the students learned the underlying maths concepts. The video is available at <http://clipit.es/landing/video/horse-jump-division/616>. Another incident demonstrated how one disruptive student continually cleared scenes from the table top storyboard that the group were developing. An undo function in the software could help handle such relational conflict.

On the other hand, groups can work well together. In a well-juxtaposed video, to explain the concept of division, a student group devised characters of Mr Root, Mrs Square and their baby Square Root. The video is available at <http://clipit.es/ou/explore/view/2480>. The settings included school where character Number Nine beat up baby Square Root and a gym where the baby grew strong. This story also revealed an obstacle that a character had to overcome – being bullied.

Much learning of the topic went on as students developed their story, discussing and debating how to create the performance. If one student did not understand, then another explained, as one later reported on his initial quiz result,

D: I found it quite easy. Only like the few last ones like twenty divided by half. I get it now

R: cos I explained it to you

This intuitive understanding that students share similar language to each other supports research from Stephens et al (2010) who found verbal communication to be a joint activity where the brain of the listener mirrored the speech of the speaker or as student, Owen, when asked if watching their video would help others, put it

“because we’re not that intelligent but older students are. We don’t know as much of the subject as they do, so people our age maybe a bit younger will understand the way we think cos they’re the same age as us”

Teachers observed other advantages to collaborative video making such as teamwork, role-play and leadership in this team. In addition, learners can face difficulties in using the terminology of the subject correctly. Such epistemic conflict (conflict within the context of the tricky topic) can be beneficial for learning (Butera, 2010) since the effectiveness of collaborative learning can depend on the richness of the interactions during collaboration (Dillenbourg and Hong, 2008, Collins et al., 2012, Dillenbourg and Tchounikine, 2007) if those interactions enable the epistemic conflict to be explored and resolved. Hence, teachers need pedagogical skills to orchestrate the learning and performance. Learners may lack the skills to plan and organise their performance.

2.5 Orchestrating learning through participative video making

Participative video (PV) making is mandatory to the JuxtaLearn process, and student participation is essential because it brings benefits to learning in both the production and the editing process (Hartnett et al., 2013a). The students need support to be able to conduct the whole process and to be able to reflect on their performance.

As well as the video making, the JuxtaLearn process involves the students in project management activities like structuring work, and assigning roles within the group. It is a layered process because, not only can participants discuss the topic under study, but also they learn media and social skills.

Tools for participation:

Storyboards: A tool of the PV process is the storyboard. Storyboards not only support the creative participative video approach but also the learning process because they require peer discussion, collaboration and presentation, thus sharing knowledge at the semantic boundary where people transfer knowledge between them (Carlile, 2004, Carlile, 2002, Hartnett et al., 2013a). See Storyboard template in Resources for teachers.

Video scripts: Writing participative video scripts is a collaborative form of writing that requires discussion with peers about the topic to perform and juxtapose. Such discussion allows the teacher to intervene to guide students, reducing epistemic conflict, and it leads to students and teacher developing common interests and new interpretations (Hartnett et al., 2013a), a task that “enables participants to see with new eyes” (DICE consortium, 2008 p.8).

Equipment

Cameras are essential, and may be whatever is available to the school or university. Flip video cameras have been cheap but are no longer available. Some schools can provide iPads, and editing software is available at only a few pounds.

Software: editing software may be available, such as iMovie for iPads. The JuxtaLearn project expects to provide editing software for use with table top equipment (WP4), thus allowing group editing. Group editing has important benefits for participative learning. The WP4 partner has designed the JuxtaLearn table top experience around the collaborative aspect - and it would not work as well on a small screen. There are Windows based tablets - such as the Microsoft Surface that do the same job as the iPad.

Props

Props or properties will depend on what the storyboard and script require. In trial workshops, students made use of relevant scientific equipment, and Plasticine or play dough, Lego or Duplo, chenille pipe cleaners, alternative clothing for costumes.

A teacher reported after a storyboarding session,

“It actually became really clear to me while they were doing it that having the Plasticine and the Duplo and everything helped them, gave them ideas to talk to each other and explain things to each other and be creative. Because that’s not my area of expertise, it wouldn’t have occurred to me that would help!”

Students have turned craft equipment to practical use such as supporting scenery (Figure 2: scenery support) or cameras (Figure 3: iPad support).

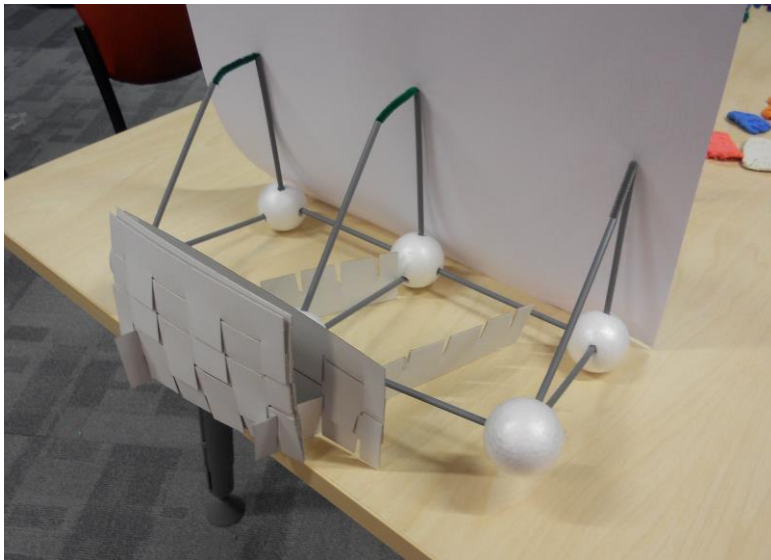


Figure 2: scenery support made of craft materials



Figure 3: iPad support

3. STORY MAKING

3.1 Nature of a story

Most stories have characters with goals and obstacles that prevent them reaching those goals. A plot comes from characters striving to reach their goal. The detective storywriter P.D. James describes the need to balance setting, characters and plot so that all three interrelate and contribute to the whole story (James, 2014).

A juxtaposed story contrasts with something else. The students' films should juxtapose with the teacher's example teaching activity. When creating a film, one of the first steps is to plan its scenes using a storyboard. A storyboard is often a paper plan with a number of cells in which to draw pictures that build on a scenario of characters and settings. To do this, students must find their characters and settings, and then identify goals and problems that prevent achieving the goals. Younger students know their fairy tales. For example, we had some 14-year-old students, whom we advised,

"Think about a fairy tale like Little Red Riding Hood. Who are the characters? What setting? Find the setting and characters in maths. A character might be an equal symbol, and or turn the division symbol into a guillotine. You can be creative about how you can turn the bus stop method of division into an exciting and creative video."

The **characters** in Little Red Riding Hood include the eponymous Little Red Riding Hood (LRRH), her grandmother, the woodcutter and the wolf. The **settings** include the wood and the grandmother's cottage. Another example is a wedding feast where the setting might be a pub or a castle. The characters are various guests who may or may not want to be sitting together on the same table. What **problem** exists? In LRRH, the protagonist is LRRH whose **goal** is to deliver food to her grandmother and the problem is the wolf that wants to eat her. If the protagonist were the wolf whose goal was to get something nice to eat, then the problem would be getting past his adversary, the woodcutter. At a wedding feast, the hosts might want all their guests to sit happily together but Aunt Matilda talks too much, and Uncle Jim drinks too much, which makes seating arrangements a problem.

Problems turn characters and settings into stories, and Lahad suggested prompts (2000 p. 99) for identifying the ingredients of a story:

1. Who is the main character of the story?(real, imaginative, single, few, human, animal, hero or heroine
2. What is the task or mission of that character?
3. Who /what can help in this task? (if any at all)
4. What is the obstacle in the way? What prevents it happening
5. How does the main character go about it? How does he/she cope with the obstacle?
6. What is the outcome? The end? Or any possible continuity?

3.2 Storyboards: what they are and how to create them

The activity for development of a story (even without videoing) can take hours. The first step to developing a performance is to draw a shared storyboard.

What is a storyboard?

A storyboard is a kind of prototype that builds on a scenario. Use a storyboard with scenarios to bring more detail, and a chance to role-play. Scenarios describe proposed or imagined situations and give an informal narrative description. A storyboard has a series of sketches that show the

settings and characters and how things progress through a task or a story. Hence, you have to find the setting and the characters in the setting.

Why create a storyboard?

Create a storyboard so you can explore a problem because it supports choosing between alternative ideas and encourages reflection (important for learning). It makes it easier to explain the topic because it answers questions. It is a good way to share because you get feedback from each other, it helps team members to communicate and others help you to expand the ideas you are working on. Using a storyboard, you can save time because you visualise before you shoot

Presentation on storyboarding

This storyboarding presentation should take only 10 minutes

Aims:

To explain the role of storyboards in learning together

Required: to run this activity:

- A3 paper for storyboarding, preferably the JuxtaLearn template –students to write stumbling blocks of the topic down the left hand side, They have examples of creative prompts on the RHS. If large touch screens are available with the software from Birmingham University, then students can work collaboratively to draw six or more scenes
- The PowerPoint presentation “Juxtaposed storyboards” available from <http://www.slideshare.net/eLizH2/juxtaposed-storyboards-20150920>
- Two videos :
 - Six people in search at <https://vimeo.com/129313911>
 - Creative juxtaposition at <https://vimeo.com/99512778>
- Briefing from teacher on storyboarding – given below

Activity description

Introduce students to the concept of storyboarding through a series of PowerPoint slides (See section on presentations)

Example briefing for the storyboard session

Teacher of secondary school students:

“The aim is to produce a storyboard. Have you used a storyboard before? Tell me what you’ve used them for? What for? When you say ‘stories’, what makes up a story? Do they tell you that in English?”

Concentrate for this, on comparing it with your maths/ computing/ other STEM subject. Juxtapose it with your maths/ chemistry / STEM subject

What does 'juxtapose' mean? You need to check with your (English/language) teacher. Juxtapose means compare and contrast – and put things side-by-side.

Juxtapose it with your STEM subject. Compare and contrast your maths with your story.

You need setting and characters. "Think about a fairy tale like Little Red Riding Hood. Who are the characters? What setting? Find the setting and characters in maths. A character might be an equal symbol, and or turn the division symbol into a guillotine. You can be creative about how you can turn the bus stop method of division into an exciting and creative video. "

Storyboard: we've set out a paper storyboard especially for you with space showing the stumbling blocks to the topic. And a space with some prompts – you've got to have characters and settings. You might start with settings; you might start with characters. The plot comes out from those. The main character or protagonist has a goal to achieve, but there's an obstacle to achieving it, and your story shows how the protagonist achieves the goal. You can also choose different genres – do you know what 'genre' means? and formats. We've got some cards¹ here to suggest different genres and formats.

After that, it's up to you. For fun, we've brought you some Duplo/ Plasticine/ craft material. It's meant to be fun"

For older students, adapt the script and use slides 1 to 8, Table 3: slides 1-8. Introduce activity and state aims (explain the role of storyboards in learning) and learning outcomes (students prepared to create develop and story and draw their group storyboards).

Discuss reasons for creating storyboards, and ask for ideas on how to get new ideas for stories. Present the PowerPoint slides to the students. Allow 5-7 minutes for this with questions. Show the later slides shown in Table 4: slides - creating a storyboard. When completed, split students into small groups to tackle their tricky topic. Give the prepared A3 storyboard paper. Then they will demonstrate their understanding of a topic by creating a juxtaposed story that addresses a stumbling block of the topic with the teaching activity from the tutor /lecturer/teacher. They will do this in small groups.

Students in the good example turned the square root symbol into a character, a baby. Indeed, they turned all the numbers into characters. The symbol's work is to reduce numbers, and from that concept, the students' plot flowed because they recognised the problem that a baby might have from bigger numbers in a school setting. Nevertheless, a square root can cut other numbers down to size and hence the protagonist can overcome the obstacle. Students in the bad example had characters with no relationship to the mathematics. They had a character on a horse that could

¹ See CPP cards in appendix of resources

not jump a barrier without converting five eighths into a decimal, but they did not relate five eighths to a character. With pen and paper, they demonstrated how to convert it but without relating it back to the story.

4. APPENDICES

4.1 Performance process

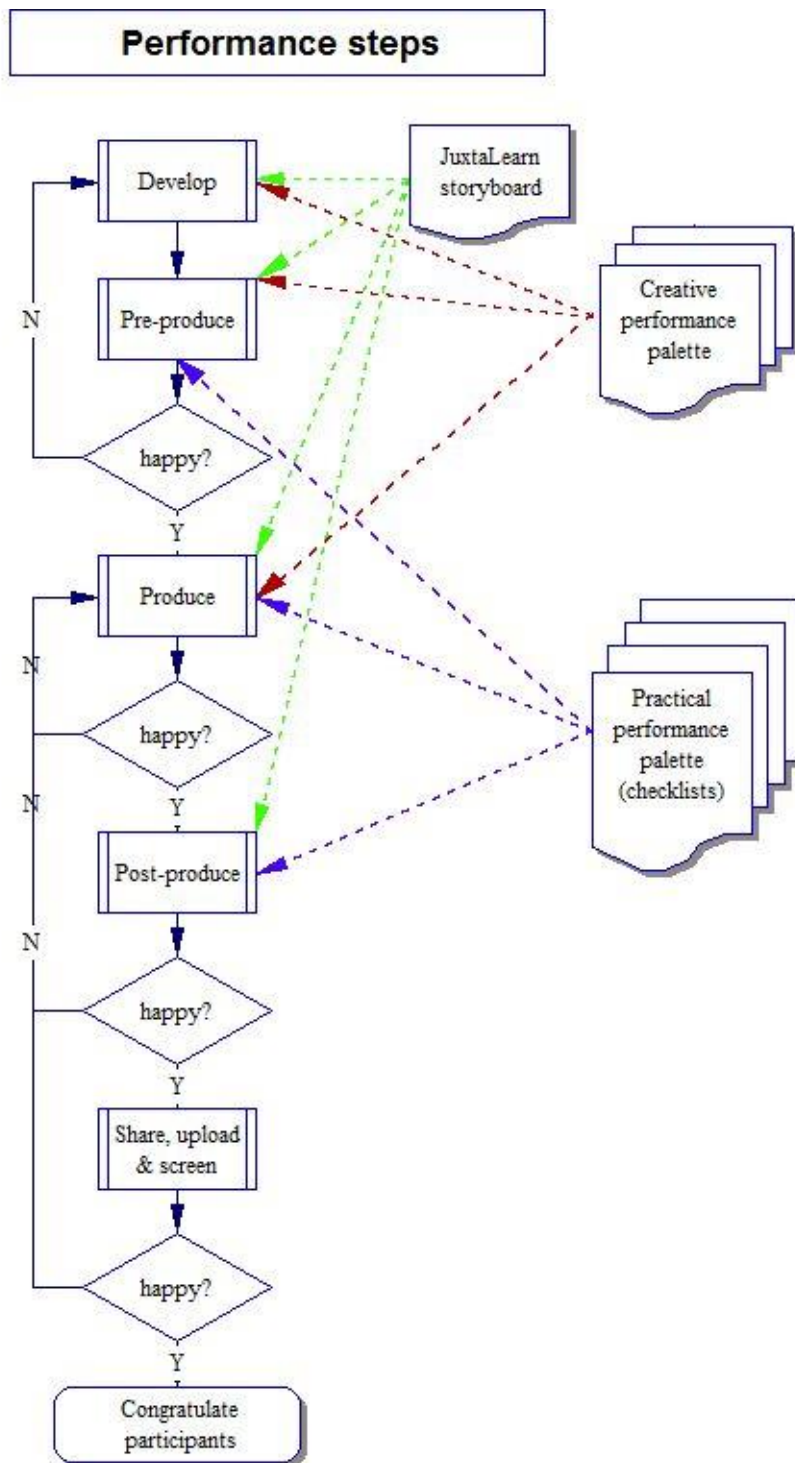


Figure 4: flow chart of performance process

4.2 Suggested timetables

During research, sometimes we were limited to trying parts of the JuxtaLearn process, sometimes we were able to run full day workshops and sometimes we ran a series of workshops. We needed overhead time for orchestrating a class, greeting and explaining, setting up equipment including allowing time for computers to boot and web sites to load. Reducing the whole JuxtaLearn to a single day does not allow students time to reflect or to organise props and assets for their performance.

Timetable for a day's workshop

We suggest a possible structure of a full day workshop, shown in Table 2: possible day-long workshop. The teachers need to prepare the tricky topic beforehand and take time to set up two quizzes per topic. They also need to have prepared students by providing them with a (e.g. a video or pen cast of) a standard lesson to cover the material relevant to the tricky topic.

Assuming a five period school day of an hour for each lesson period with four periods before lunch and one after:

Table 2: possible day-long workshop

Time to allow	Activity	Resources
Pre-workshop day	Teacher will prepare, present or provide students with material that introduces the tricky topic. Teacher allocates students to groups according to needs and possibilities. Such allocation may vary with institutional and national culture	Presentation, pen cast, textbook, lecture, video
Pre-workshop day 20-30 minutes	Allow time to boot computers and settle a class. Time may be necessary for recalling the tricky topic, depending on how long since its introduction. Initial quiz of understanding of the tricky topic, assuming the quiz will take around 10 minutes	Computers with operating systems later than XP, and internet access to ClipIt web site A list of student ids and passwords, (already set up by teacher or researcher) ClipIt and initial teacher devised quiz
Workshop day		
10-15 minutes	Discuss how to juxtapose in performance by choosing a setting and characters. Choice of genre and format can vary.	
an hour	In groups, students collaborate to develop their storyboard, discussing ideas about their performance and how it relates to the topic. Teacher observes and advises on the topic's stumbling blocks.	Storyboards on paper, access to JuxtaLearn group touch screen software if possible
Half an hour to an hour	Teacher and group discuss potential performance in relation to the stumbling blocks. Allow group preproduction time e.g. to allocate roles, find assets, decide location, with reference to the storyboard	
An hour	Groups start to produce video scenes, with the potential	Video equipment / flip

Time to allow	Activity	Resources
	to return to the storyboard, redraw and rescript, aiming for a short video of between three and five minutes. Because film is a visual medium, scripts do not need be characters talking, but can extend the storyboard's telling of the story in pictures by giving narrative description of scenes and characters and instructions for editing, as well as any speech.	cameras/ iPads, tripods,
Half an hour to an hour	Post-production composing: compose shots to match storyboard. Edit shots as necessary. The group reflectively discusses how it explains the stumbling blocks, checking with the teacher, and reshooting if necessary. At this stage, the group might also want to voice-over a script, or add text. We observed students dictating scripts to each other and writing them. See example at Figure 5: dramatic script for performance on page 24.	Editing software, video software,
One hour	LUNCH	
10 – 20 minutes	Have a class discussion of progress so far, of what their stories are so far, and if any videos are partly ready, then to look at the first cuts.	Large screen for sharing, camera connectors, computer
30 -45 minutes	for post-production, composing scenes to match storyboard and editing, doing retakes cutting down, assembling and retaking some scenes if necessary to make the story clear and short (3-5 minutes)	ClipIt, editing software,
15-30 minutes	class focus group discussion to view videos, discuss and share students' opinions and feedback on their learning, time allowed depends on number of groups and videos to view	Large screen for sharing, camera connectors, computer

From workshops, reported in D3.4, we have evidence that the students like to present their products and look at "happened so far" videos, but in the schedule in Table 2 there is little or no time to look at the videos. Viewing the "happened so far" videos could be done in a later session.

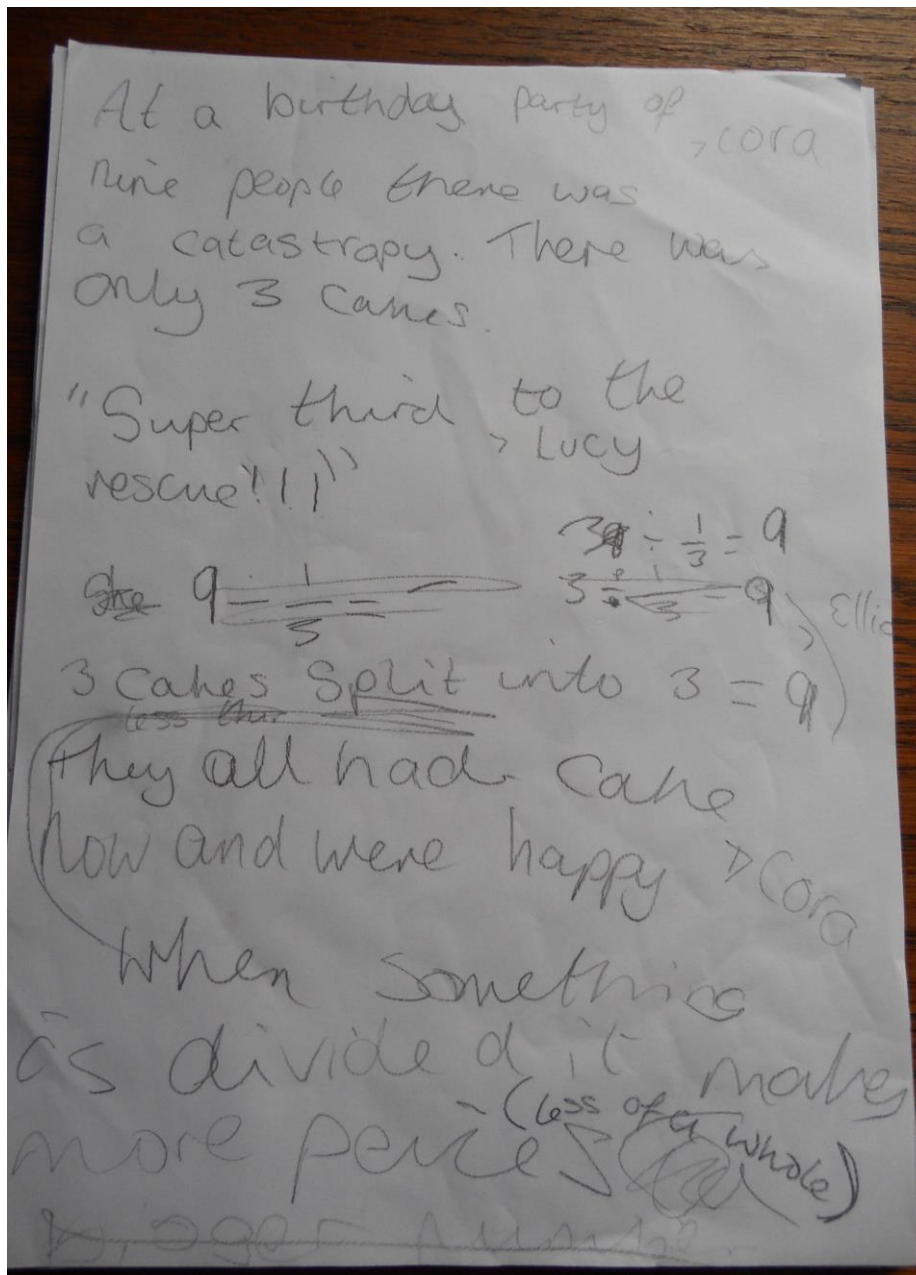


Figure 5: dramatic script for performance

Timetable for a series of five forty-minute sessions:

First session:

Teacher will have taught students about topic and given them an ETA in advance. The aim of the first session is to introduce JuxtaLearn (learning through video creation) and get students in class to take the Diagnostic Quiz. This session can also be used to get an initial understanding of these students' approach to learning by using the Biggs Learning Process Questionnaire (Biggs and

Australian Council for Educational Research, 1987). See details of the quiz and survey in deliverables for work package 2.

Timing	Activity	Equipment /resources
10 minutes	Introduction while students log on and computers boot up	Computer / ICT room, learning questionnaire, quiz on ClipIt
15 minutes	Students take a questionnaire on their attitude to learning.	Learning questionnaire
15 minutes	Students take quiz. The quiz should take only ten minutes but allow extra time for students to find the questionnaire and the page to load.	Quiz on ClipIt
10 minutes	Class and teacher view and discuss their quiz radar charts as a whole class focus group. If there is time, teacher advises students on meaning of juxtaposing in anticipation of the following session, and shows students the storyboard template, explaining that this is what they will be doing next.	Radar charts from ClipIt (WP2)
Homework	Reflect on the topic. Think about possible stories.	

Second session: The aim of this second session is to develop a story by creating storyboards

Timing	Activity	Equipment /resources
10 minute	Greet students. Explain storyboards and show students the storyboard template. Explain juxtaposing.	Group touch screen equipment with storyboarding software if available (WP4), paper storyboards (see template in appendix), creative performance palette cards (CPP) ² to prompt the teacher and students. Example storyboards
35 minutes	Students discuss ideas in their groups for video characters and storyline. Students create storyboards. Teacher provides expertise on the stumbling blocks	Plasticine, Lego/Duplo, craft items, e.g. chenille pipe cleaners, toys (see resources), pens, post-its, for alternative thinking activities. Damp cloth / wipes for cleaning desks of Plasticine/ play dough.
5 minutes	Allow time to clear up and brief for the following sessions	Trays for storing storyboards and any half created props
Homework	Students collect props. Students return home, encouraged to talk about and develop their stories	

² See examples of CPP cards in appendix of resources for teachers

Third session: The aim of the third session is to complete storyboards and **pre-produce** by anticipating and collecting resources and assets and props.

Timing	Activity	Equipment /resources
10 minutes	Greet students. Return their storyboards and props from the previous week. Discuss characters, setting, and introduce genre and format as options for their performance. Suggest they think of angles of shots (close, distance) and sound effects (loud, soft)	Group touch screen equipment from WP4 with storyboard, paper storyboards, creative performance palette (CPP) cards as described in deliverable D3.3 (Hartnett et al., 2013b) to prompt the teacher and students. ³
15 minutes	Students develop ideas in their groups for video characters and storyline. Students create storyboards. Teacher provides expertise on the stumbling blocks	Plasticine, Lego/Duplo, toys, pens, post-its, for alternative thinking activities
10 minutes	Students share storyboards so far with the teacher and class for wider discussion and reflection. Discuss roles for creating the performance.	
5 minutes	Allow time to clear up and brief for the following sessions	Trays for storing storyboards and any half created props
Homework	Students collect props.	

Fourth session: Aim of this fourth session is to **produce** video and start the compose stage.

Timing	Activity	Equipment /resources
10 minutes	Greet students. Discuss video footage so far.	Students' storyboards Video cameras, tripods, iPads, ClipIt
30 minutes	Students film final shots if necessary. Students upload their footage to the editing software and their compose video.	Group touch screen software
10 minutes	Students upload video to Clipit and share with peers	
Homework	If students have uploaded their finished videos, homework can be to comment on videos. If videos are not yet finished, homework may be to finish and upload videos and comment on other videos depending on institution and access to technology.	

Note: It may turn into a video creation workshop. If this happens, then the compose stage will need to happen outside class or at the start of the next lesson. Uploading the videos may also happen later. It will not be possible to do the commenting if the videos are not finished in time.

Fifth session: Aim of this fifth session is to reflect on the learning and on the JuxtaLearn process as a whole.

Advance preparation: Students have uploaded finished videos to ClipIt

³ See examples of CPP cards in appendix of resources for teachers

Timing	Activity	Equipment /resources
10 minutes	Greet students and identify issues and progress this far	Storyboards, ClipIt
10 minutes	Review videos against original storyboards in groups	
20 minutes	Whole class review videos and discuss	
Homework	Comment on videos	

4.3 Resources for teachers

Resources can help to generate ideas. Wright Mills (1959) suggests seven techniques for getting ideas: re-arranging files; playing with phrases and words; classifying notions; considering extremes – thinking of the opposite; inverting sense of proportion; comparing materials; and arranging materials for presentation, identifying and sorting the main themes. These techniques require juxtaposing e.g. inverting, identifying opposites and comparing. Physical objects concretise these techniques so we suggest using craft material.

Creative equipment

Provide craft materials, playing cards, pens and paper. Students may creatively combine material to get across their message. For example, in the JuxtaLearn video ‘Pizza Power’ available at <http://clipit.es/ou/explore/view/2479>, students used Duplo, Plasticine, and matchsticks. Younger students can both be distracted by craft materials such as Plasticine or polystyrene balls and creatively stimulated by what their peers can do with them. Paper and card can provide visual backgrounds as settings. Keep a box of tricks and toys such as Plasticine or clay, pipe cleaners, anything to fiddle and play with. These also help to prop up an iPad camera or a paper backdrop. Ayling (2012) advocates play-based methods of learning that include drawing (needs equipment) and storytelling (needs JuxtaLearn storyboard template).

Provide small toys for playing: toy animals, vehicles, soldiers, monsters, dinosaurs, superhero figures, houses, people figures, slime goo/play dough/ Plasticine/ clay, soft toys, Duplo/Lego, and miniature men/dolls. Provide a box preferably with a lid, or tray per group to keep their storyboards and materials between sessions. A lid helps prevent playdough drying up between sessions.

Videos

- Tricky topic tool at <https://vimeo.com/109829640> (Clough, 2014a)
- Script to screen at <http://www.catchermedia.co.uk/Discover/Film%20School/> (Goldsmith, 2010)
- “Six people in search of” at <https://vimeo.com/129313911>
- Examples of existing JuxtaLearn videos at <http://clipit.es/landing/videos/clipit-ou/593>

Technical equipment

- **Cameras:** Use simple video cameras such as Flip videos; iPads are useful for group work and offer affordable editing software such as iMovie for around £3.00. Use tripods if available.
- **Sound:** When sound is an issue, e.g. in a crowded school dining room, use Bluetooth audio devices if available. If working outside, be aware of wind noise.
- **Lighting:** Set up good lighting. Use cheap equipment an angle poise lamp or a powerful domestic torch. You can use tin foil, tracing or baking paper, clothes pegs and Blu Tac to light scenes in creative and miscellaneous ways.

- **Table top software**

A problem of paper storyboards was that students sometimes pled lack of artistic skills and left drawing to one individual. To address this, we added a technological solution in the form of shareable touchscreen software that allows several students at once to create their storyboard. This touchscreen is about a metre by half a metre, connects to a laptop and can be laid on a table around which several students can congregate to work together. We ran a workshop with five small groups of students (three or four in each group) in which the students aimed to video a maths story juxtaposed with their teacher's explanation. Each group first drew, or more often *wrote* their storyboard, and then in turn gathered to use the touch screen.

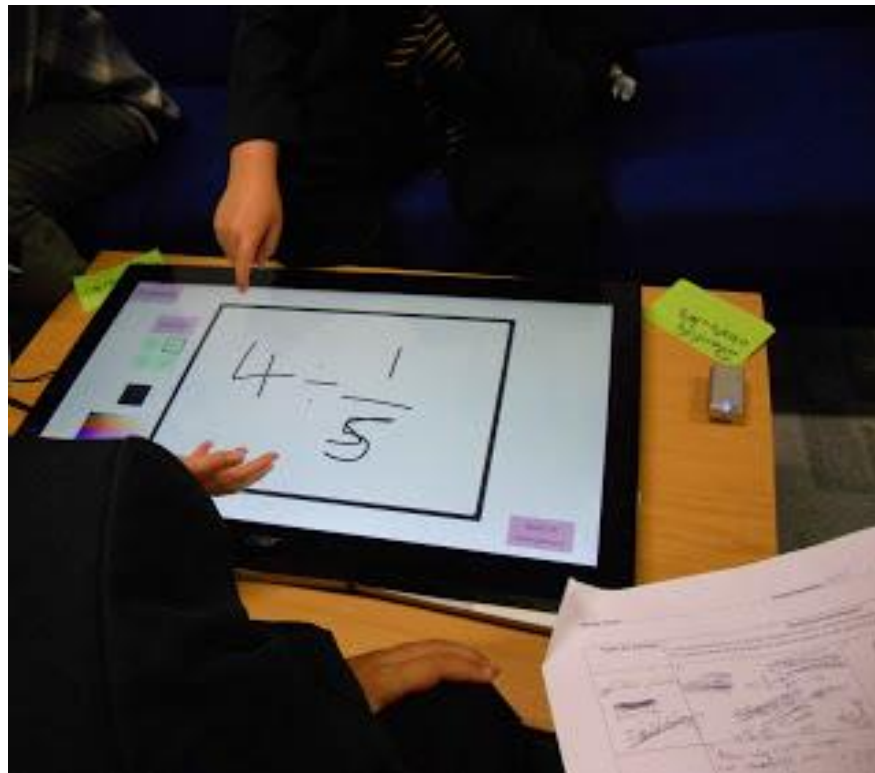


Figure 6: group working with the shared table top touch screen

Figure 6 shows a group beginning to work with the touch screen with hands from two students pointing at the screen thus demonstrating their verbal discussion of the story.

Figure 7 shows the two versions of a group's storyboard. Their written paper storyboard becomes electronic pictures. Notice the inclusion of musical notes in anticipation of adding sound.

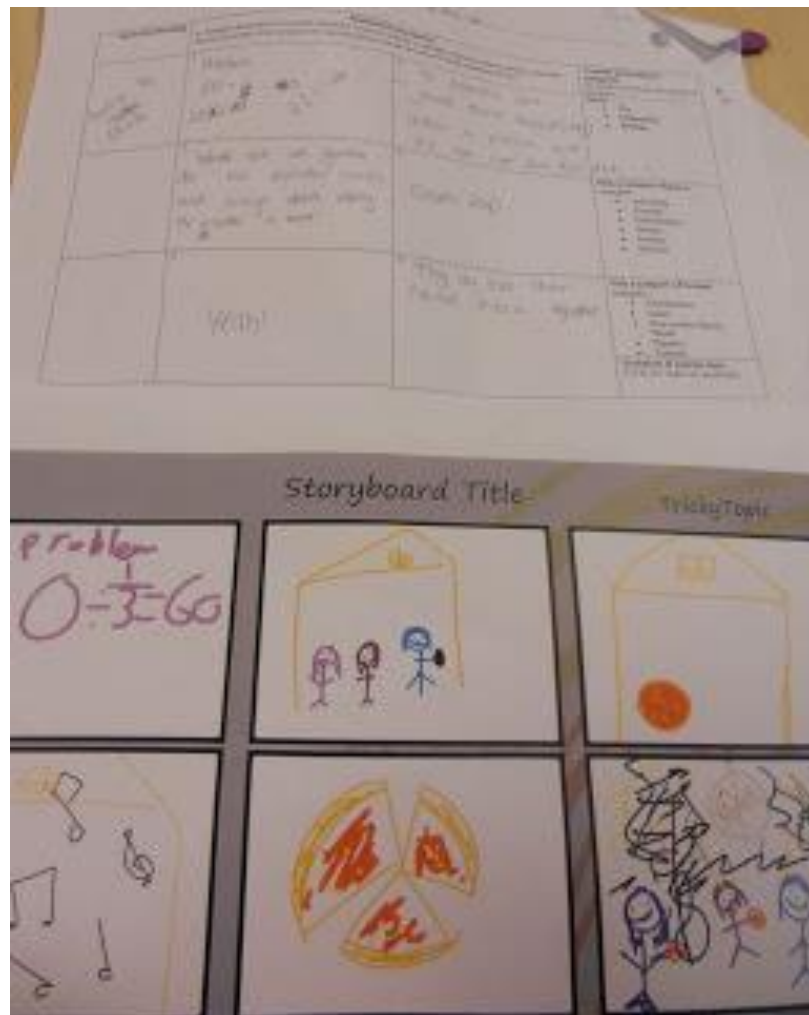


Figure 7: paper storyboard & touch screen storyboard

Presentations

Slides and video of how to make a juxtaposed video or film

On storyboarding

- <https://www.slideshare.net/eLizH2/juxtaposed-storyboards-20150914>

On juxtaposing:

- <https://vimeo.com/129313911> - Six people in search of a way through a tunnel
- <https://vimeo.com/105031876> - How to juxtapose a tricky topic
- <https://vimeo.com/109331885> -How are we going to do that? Juxtaposing performance with learning

Download more resources and tips from Catcher Media at <http://www.catchermedia.co.uk/Discover/workshop4/Catcher%20Media%20Pack%20NEW%20OPV%20resource%205.pdf>

Slides

Table 3: slides 1-8 storyboards – what are they?

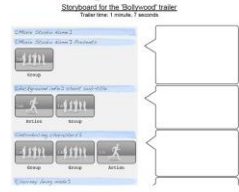
<p style="text-align: center;">Juxtaposed storyboards: what are they?</p> <p style="text-align: center;">Presenting a tricky topic scenario</p>	<p style="text-align: center;">Think of your topic</p> <ul style="list-style-type: none"> • What do you stumble over? • What questions about it can't you answer? • What's tricky? <p style="text-align: right; font-size: small;">20/09/2015 e.hartnett@open.ac.uk 2</p>																
<p style="text-align: center;">Storyboard – what is it?</p> <p>A storyboard is a prototype that builds a scenario</p> <p>A scenario describes the setting and characters</p>  <p style="text-align: right; font-size: small;">20/09/2015 e.hartnett@open.ac.uk 3</p>	<p style="text-align: center;">Storyboards build on scenarios</p> <p><i>What is a scenario?</i></p> <ul style="list-style-type: none"> • Scenarios describe proposed or imagined situations • Scenarios give an informal narrative description, like a story <p>Example scenario:</p> <p style="padding-left: 20px;">A young woman is taking a driving test in a strange town – what's her problem?</p> <p style="text-align: right; font-size: small;">20/09/2015 e.hartnett@open.ac.uk 5</p>																
<p style="text-align: center;">Here's a JuxtaLearn storyboard</p> <p>Group name: _____ Group members: _____</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">Topic for learning</th> <th style="width: 25%;">Institutional context</th> <th style="width: 25%;">Contextual performance</th> <th style="width: 25%;">Competence</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table> <p style="text-align: right; font-size: small;">20/09/2015 e.hartnett@open.ac.uk 8</p>	Topic for learning	Institutional context	Contextual performance	Competence													
Topic for learning	Institutional context	Contextual performance	Competence														

Table 4: slides - creating a storyboard for a juxtaposed performance

<p>Steps to answer: in groups</p> <p>HOW DO YOU GET NEW IDEAS?</p> <p>20/09/2015 e.hartnett@open.ac.uk 9</p>	<p>First, look at your topic:</p> <ul style="list-style-type: none"> • Choose a problem you stumble over • Identify character(s) – human, animal, maths symbol, object, xx? • Identify the setting – is this an object or an xx? Or is it a method, or a castle or a yy? <p>20/09/2015 e.hartnett@open.ac.uk 10</p>						
<p>Six-part story making</p> <ol style="list-style-type: none"> 1. Who is the main character of the story? 2. What is the task or mission of that character? 3. Who /what can help in this task? 4. What is the obstacle in the way 5. How does the main character go about it? 6. What is the outcome? <p>(Lahad, 2000)</p> <p>20/09/2015 e.hartnett@open.ac.uk 11</p>	<p>Think of your story</p> <ul style="list-style-type: none"> • identify an individual character, • set the character a task to achieve, • identify obstacles • identify solutions. <p>For each prompt, draw a cartoon picture on the storyboard.</p> <p>20/09/2015 e.hartnett@open.ac.uk 12</p>						
<p>Secondly, pick an alternative juxtaposed scenario</p> <p>Talk about a scenario with your colleagues.</p> <ul style="list-style-type: none"> – Identify characters – Identify the setting • For example, suppose someone is taking a driving test, the setting is a road and the characters are learner and examiner. <p>Playing or fiddling with something / cards/ beads/ Plasticine may give you ideas</p> <p>Juxtapose your scenario with the topic activity (in the unit, the book or from the tutor /lecturer /teacher)</p> <p>20/09/2015 e.hartnett@open.ac.uk 13</p>	<p>What do you do to juxtapose?</p> <table border="1" data-bbox="850 1503 1390 1619"> <tr> <th>1. Teacher's scenario</th> <th>2. A juxtaposed scenario</th> </tr> <tr> <td>Identify setting of topic</td> <td>Create a new setting</td> </tr> <tr> <td>Work out what character there might be in the topic</td> <td>Invent new characters in the new setting</td> </tr> </table> <p>See video (36 seconds) https://vimeo.com/99512778 on "Creative juxtaposition" at https://vimeo.com/elizh/videos</p> <p>20/09/2015 e.hartnett@open.ac.uk 14</p>	1. Teacher's scenario	2. A juxtaposed scenario	Identify setting of topic	Create a new setting	Work out what character there might be in the topic	Invent new characters in the new setting
1. Teacher's scenario	2. A juxtaposed scenario						
Identify setting of topic	Create a new setting						
Work out what character there might be in the topic	Invent new characters in the new setting						


Juxtapose your topic

1. Use a juxtaposed storyboard (hand-out)
2. Choose your stumbling block to work on
3. Draw your story cells
4. Work out your script
5. Practise it
6. Show us

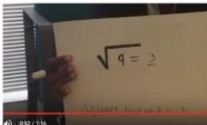
Let's compare your presentation with the standard teaching of that stumbling block

20/09/2015 e.hartnett@open.ac.uk 15

What to do: a juxtaposed example





Baby Square Root beats up Nine I'm free! Three!



<http://clipit.es/landing/video/square-root-beats-the-bully/604>

26/10/2015 e.hartnett@open.ac.uk 17

What not to do: example

Visually pretty but lacks juxtaposed characters

<http://clipit.es/landing/video/horse-jump-division/616>

26/10/2015 e.hartnett@open.ac.uk 18

- Also see <http://www.slideshare.net/eLizH2/juxtaposed-storyboards-20150920>

Paper storyboard template

Group Name: Names of members:

<p>Stumbling Blocks</p>	<p align="center">JuxtaLearn storyboard for</p> <p align="center"><i>a) Identify character(s) b) set the character a task to achieve c) identify obstacles and d) identify solutions. For each prompt, draw at least one cartoon picture on the storyboard in the numbered boxes</i></p>		<p>Creative performance categories</p> <p><i>See hand-out cards for descriptions & examples</i></p>
	1	2	<p>Story:</p> <ul style="list-style-type: none"> • Plot • Characters • Setting <p>Pick a category of genre: examples</p> <ul style="list-style-type: none"> • Adventure • Comedy • Documentary • Drama • Fantasy • Musical <p>Pick a category of format: examples</p> <ul style="list-style-type: none"> • Commentary • Game • Non-verbal: Dance, Music • Puppets • Tutorial <p>Technical & logistic lists:</p> <p><i>P.T.O. for index of check lists</i></p>
	3	4	
	5	6	

On the other side of this storyboard, include checklists: List of assets, e.g. props, costumes, images, existing video clips, sound, Plasticine, puppets, people, toys; Scripts for speakers; any technical equipment, e.g. iPad, iPhone, video, recorder, pointer, USB stick,

Creative Performance Palette cards

JuxtaLearn Performance Palette Genre	JuxtaLearn Performance Palette Genre
	
JuxtaLearn Performance Palette Genre	JuxtaLearn Performance Palette Genre
	
JuxtaLearn Performance Palette Genre	JuxtaLearn Performance Palette Genre
	

Back of genre CPP cards

<p>Action</p> <p>Genre Genre is the style or category of the performance. Use the style and clichés of a to sell a film to a particular kind of audience E.g. a typical horror film has a different set of clichés from those of a romantic comedy</p>	<p>Description</p> <p>Action includes creative fiction with exciting sequences such as car chases or martial arts</p> <p>Example</p> <p>Bruce Lee, James Bond, The Hunger Games: catching fire (2013)</p>	<p>Adventure</p> <p>Genre Genre is the style or category of the performance. The style and clichés of a genre are used to sell a film to a particular kind of audience E.g. a typical horror film has a different set of clichés from those of a romantic comedy</p>	<p>Description</p> <p>Adventure is fiction writing where the story is about something exciting & risky happening.</p> <p>Example</p> <p>King Kong (2005), Indiana Jones films</p>
<p>Comedy</p> <p>Genre Genre is the style or category of the performance. Use the style and clichés of a to sell a film to a particular kind of audience E.g. a typical horror film has a different set of clichés from those of a romantic comedy</p>	<p>Description</p> <p>A comedy is an amusing plot, written to please and cause people to laugh</p> <p>Example</p> <p>Mrs Brown's Boys on BBC Pink Panther films with Peter Sellers as Inspector Clouseau Jacques Tati – Monsieur Hulot's Holiday (1953) Robert Altman's M*A*S*H (1970)</p>	<p>Drama</p> <p>Genre Genre is the style or category of the performance. The style and clichés of a genre are used to sell a film to a particular kind of audience E.g. a typical horror film has a different set of clichés from those of a romantic comedy</p>	<p>Description</p> <p>Drama is a (usually) serious performance of fiction, and might be comedy or tragedy. It has an underlying plot, realistic characters and settings.</p> <p>Example</p> <p>Shakespeare's plays</p>
<p>Fantasy</p> <p>Genre Genre is the style or category of the performance. Use the style and clichés of a to sell a film to a particular kind of audience E.g. a typical horror film has a different set of clichés from those of a romantic comedy</p>	<p>Description</p> <p>Fantasy is fiction that uses magic, imagination, the supernatural and fantastic to plot the story. It may also be considered a sci-fi genre.</p> <p>Example</p> <p>The Lord of the Rings Harry Potter & the Deathly Hallows Pan's Labyrinth (Spain 2006)</p>	<p>History</p> <p>Genre Genre is the style or category of the performance. The style and clichés of a genre are used to sell a film to a particular kind of audience E.g. a typical horror film has a different set of clichés from those of a romantic comedy</p>	<p>Description</p> <p>This genre includes stories of adventure, biography, drama or war.</p> <p>Example</p> <p>Elizabeth (1998) All Quiet on the Western Front (Germany 1930)</p>

CPP cards – format



Back of CPP cards - format

<p>Animation</p> <p>Format Format is the manner of executing a performance</p>	<p>Description</p> <p>To animate a film, the filmmaker films drawings, or models frame by frame. Each frame differs slightly from the one before it, giving the illusion of movement when frames are projected in rapid succession at 24 frames per second.</p> <p>Example</p> <p>Snow White (1937). Shrek, (2004)</p>	<p>Behind the scenes</p> <p>Format Format is the manner of executing a performance</p>	<p>Description</p> <p>A behind-the-scenes is a documentary that uses video to discuss the process of making the video, the roles taken in its production, and the learning from experience. It might look at the costumes, the scene, , wardrobe, and take-outs.</p> <p>Example</p> <p>Lost In La Mancha (Gilliam 2002)</p>
<p>Chat show</p> <p>Format Format is the manner of executing a performance</p>	<p>Description</p> <p>A chat show involves a host and a guest or guests who discuss the topics and questions that the host puts to them.</p> <p>Example</p> <p>Richard & Judy The Jerry Springer show Die Harald Schmidt Show</p>	<p>Game</p> <p>Format Format is the manner of executing a performance</p>	<p>Description</p> <p>A game is play that is <i>fun</i>, provides a challenge or a goal, with rules that allow or constrain moves or behaviours or things.</p> <p>Example</p> <p>Space invaders Noughts and crosses (tac-tac-toe) Carcassonne</p>
<p>Piece-to-camera</p> <p>Format Format is the manner of executing a performance</p>	<p>Description</p> <p>Presenter addresses the camera directly, and by association the audience. This has an immediate and direct effect on the audience. It is used in a video diary format or when a news reporter is in a dramatic situation and is reporting directly</p> <p>Example</p> <p>Reporting from a famine zone</p>	<p>Non-verbal</p> <p>Format Format is the manner of executing a performance</p>	<p>Description</p> <p>Other means than words are used to put across the message.</p> <p>Example</p> <p>Juggling, dance, silent movie, music</p>

4.4 Use cases

This section describes various scenarios from observed cases, and, assuming a full-time educational setting provides guidance for each of four steps of the performance process. It also describes a case that worked with only the first (development) step with limited resources, no available technology.

JuxtaLearning use cases

This section is structured around the five steps of the performance process, summarised in Figure 4: flow chart of performance process in the appendix 4.1 . In particular, we report on the use of a storyboard to orchestrate activities (or not). We are not ignoring dramatic scripts, but the students in the use cases made less obvious use of scripts.

Scenarios from use cases

In D3.4, we described several use cases, scenarios where the setting varied being schools chemistry laboratories, church halls, drama studios and college classrooms. The students varied being secondary, college and university level students. The timings varied between single full day workshops, half-day sessions, and a series of class sessions. One scenario ran in both 2013 and 2014 (chemistry one day workshop in a secondary school). Another scenario, a two-hour tutorial took place in 2014 and again in 2015, and we describe that second tutorial in an appendix of this document. We know that the JuxtaLearn process can be varied, available to a variety of abilities, flexible to time and place.

Possible scenarios arise from initial diagnosis, such as a student revealing a problem with a topic in face-to-face sessions, or a teacher notices stumbling blocks as he or she marks homework. Consequently, a teacher may plan a single performance session, or several sessions to cover all the JuxtaLearn process. Alternatively, a school might organise one-day JuxtaLearn workshops. Table 5: lists some scenarios of subject, place and people, gathered during data collection for this research.

Table 5: use cases

Problem subject	Place	People	Timings
Chemistry	Secondary school, science laboratory and school garden	Students starting final exam courses, preparing for university	Four hours on one day, with an hour for lunch
Theatre studies	Secondary school, drama studio, dining hall, and gym	Students starting final exam courses, preparing for university	Four hours on one day, with an hour for lunch
Religious studies	Church hall in school holidays	Primary	Five two-hour morning sessions
Computer science	A rented classroom in a university on a Saturday morning	A dozen mature students, men and women, including speakers of other languages	Two hours
Networking	A rented classroom	One mature female student with a	Half an hour

technology	in a university on a Thursday evening	higher degree already	
Maths	Secondary school	Students that need booster (extra) classes	Five 40 minutes lunchtime sessions
Maths (division)	Secondary school	About thirty twelve-year olds at the end of their first year in secondary school	Six 50 minute classes
Maths (division)	Secondary school	About thirty twelve-year olds at the end of their first year in secondary school	One 50 minute class & a day's workshop
Maths (fractions)	Secondary school	About thirty eleven year olds (lower set) at the start of their first year in secondary school	One 50 minute class & a day's workshop

Most of these scenarios were described in D3.4. An additional computer science session is described in this document in Use case of interpret and perform stages (two-hour session).

Next, we suggest ways of planning to teach each step of the performance process.

Guidance for step 1: develop

Title of activity: What is a juxtaposed storyboard?

Aim: To explain the role of storyboards in learning together

Group creation of the story as shown on the storyboard requires peer discussion with a teacher eavesdropping and intervening when necessary, probably to ask how the story relates to the topic of study. At this point, the teacher can correct any misunderstandings that the students reveal, and encourage them.

Learning outcome(s) addressed

- To give students an understanding of the issues to consider when planning a creative performance
- To relate these issues to their tricky topic
- Juxtaposed storyboards – what they are, and how to create them for a tricky topic scenario
- To demonstrate to students how to create a juxtaposed storyboard

Time to allow	Activity description	Equipment /resources
15 minutes	Introduce students to the concept of storyboarding through a script or a series of PowerPoint slides or a video and the use of a JuxtaLearn storyboard template.	A video presentation or a PowerPoint presentation (see section on resources for teachers in 3.5) or self-explanatory features of the table top software from WP4
Forty minutes to an hour	Split students into small groups e.g. three to five, at least two of whom should have started learning the material. In creating the groups, also take into account existing (if any) relationships that might affect the	Paper based storyboards (see appendix template) and table top software if available learners may plan physical performance or they may use models, mime, puppets and other objects.

Time to allow	Activity description	Equipment /resources
	learning. Ask students to: <ul style="list-style-type: none"> • Talk together about a scenario. • Identify characters • Identify setting Then students apply their understanding to juxtaposing a tricky topic with the ETA from the tutor, carrying it out in small groups. Groups collaboratively develop their storyboards. As the groups work, the teacher goes round checking students' understanding of the topic.	A3 paper or larger for storyboarding, preferably in the JuxtaLearn template with the name of the tricky topic, the identified stumbling blocks on the left hand side, a few creative prompts on the RHS and a space for the group names The touch surface software provides creative prompts. Textbooks, pen casts or videos of the topic, that students might relook at as they prepare their video

Typical student difficulties of performance

- developing an initial idea
- drawing the storyboard
- implementing their first idea
- matching their ideas to the stumbling block
- explaining the stumbling block through sound and vision
- seeing themselves as creative
- working together

A helpful approach is to give the students prompts for constructing their story (Lahad, 2000). Prompt students to

- identify an individual character,
- set the character a task to achieve,
- identify obstacles
- identify solutions.

For each prompt, draw a cartoon picture on the storyboard. For further comment, see the appendix on the Nature of a story.

Note: the ways given below of splitting students up into groups to collaborate and report are a suggestion; you may find that other ways work better for you and your student group. Feel free to adapt these activities to meet the needs of your students.

The development activity can take from 45 minutes to a day depending on time available, but the storyboarding presentation should take only minutes. Allow 5-15 minutes.

Guidance for step 2: pre-produce

Title of activity: The practical issues of developing a storyboard

Learning outcome(s) addressed

This second step aiming at collecting the assets required to create the video also allows further peer-peer and student-teacher discussion of the subject problem.

Time to allow	Activity description	Equipment / resources
Half an hour to an hour	of group preproduction e.g. allocate roles, find assets, decide location, with reference to the storyboard	Shared storyboard, instructions on how to use equipment
An hour	participative video production	

Expect development and pre-production steps to merge and iterate

Guidance for step 3: produce & film

Title of activity: producing the film

Learning outcome(s) addressed

Shoot the film and compare its presentation with the standard teaching of that stumbling block

Time to allow	Activity description	Equipment / resources
Half an hour to an hour	Set up film equipment, Shoot the film.	Camera, or iPad, or flip camera, audio recording devices, cameras with spare batteries, lights if needed, and use blue tooth audio if sound is difficult

Guidance for step 4: post-produce

Title of activity: post-production, editing and composing

Learning outcome(s) addressed

Students arrange shots into sequence

Time to allow	Activity description	Equipment / resources
Half an hour to an hour	Post-production composing: compose shots to match storyboard. Edit shots as necessary. Add voice, whether speech or voice-over or text explanations.	Software for editing and composing (WP4)
45 minutes	compose scenes to match storyboard, editing and doing	

Time to allow	Activity description	Equipment / resources
	retakes if necessary	
15 – 30 minutes	class focus group discussion to view videos, discuss and share students' opinions and feedback on their learning, time allowed depends on number of groups and videos to view	

JuxtaLearn should aim to use the minimum of simple equipment. Using two angle shots with two cameras makes editing at the post-production step more complex and it takes more time to compose the combined films and synchronise the sound when blending the takes. Therefore, in order to concentrate more on the topic to learn, it is advisable to keep the technology simple. Use only one camera.

Use case of interpret and perform stages (two-hour session)

We tested two stages of the JuxtaLearn process with adult distance learning students who gathered at a hired location for a two-hour face-to-face tutorial with a tutor they had not met before. Distance learning material that most students had begun to read provided the Interpret stage. The Performance stage involved only the first step: development.

The **topic** of study was programming object-oriented collections in Java. The **constraints** included:

- The students did not appear to know each other and had different tutors.
- The tutor had not met the students before
- The room was hired from another organisation
- No online connection was available, so students and tutor had no access to web-based quizzes.
- It was not known beforehand how many students to expect, or which students to expect
- Some students would have read ahead on the material, and others would have barely skimmed it.

The tutorial ran twice, once in 2014 and once in 2015. Deliverable D3.4 (Hartnett et al., 2014) described the 2014 tutorial.

In 2015, nine students turned up. The tutor welcomed them and got them to introduce themselves briefly to the others. This activity elicited some information about how far students were in their studies and whether they had already read the relevant material. Some had, but others were diffident and under confident. The tutor then presented a ten-minute example teaching activity (ETA) on the topic before giving a short quiz without answers and explaining to the students that they should now create their own presentation on the topic, aiming to create a fun, and engaging presentation that would juxtapose with the ETA. The tutor also discussed using storyboards to plan the presentation, eliciting some suggestions from the students as to the benefits of

storyboards. These included sharing ideas, encouraging reflection, saving time, and because you visualise without needing words. The tutor encouraged the groups to aim to juxtapose their presentation with a standard teaching presentation, by exploring and analysing the teacher's scenario before creating a juxtaposed scenario. See Table 1: juxtaposing teacher & student scenarios.

Each group then had a shared storyboard on A3 paper with which to plan their presentation.

Students discussed, presented, fed back and relooked at the quiz. Thus, the two-hour session covered the interpret stage of the JuxtaLearn process and the initial step of the perform stage: develop.

The groups each had four students (+1 who arrived 40 minutes late), rather than three groups of three which it might have been if all nine had been there at the start. The groups then in turn stood at the front of the classroom and presented their stories. The other group of students listened and the tutor sat to one side. After the presentation, the other group commented and asked questions that the presenting group addressed. If any misconceptions of the material were present, the tutor intervened.

The two presentations were very different, one fun and imaginative and the other serious and useful. The fun group smiled and laughed more noticeably. Both groups raised questions and appeared to learn from their efforts. Having only two groups left lots of time for discussion and questions, which allowed people to raise questions.

The two groups developed two different scenarios. One was set in an aquarium full of fish tanks with different attributes like size or type of water (sweet or salt). This first group (A) invented a character that was a fish, called Nemo. The plot was that Nemo had a problem of choosing the best fish tank for his holiday. See Figure 8: storyboard Group A - a fish called Nemo. Nemo can enumerate the tanks to choose a tank that matches his requirements.

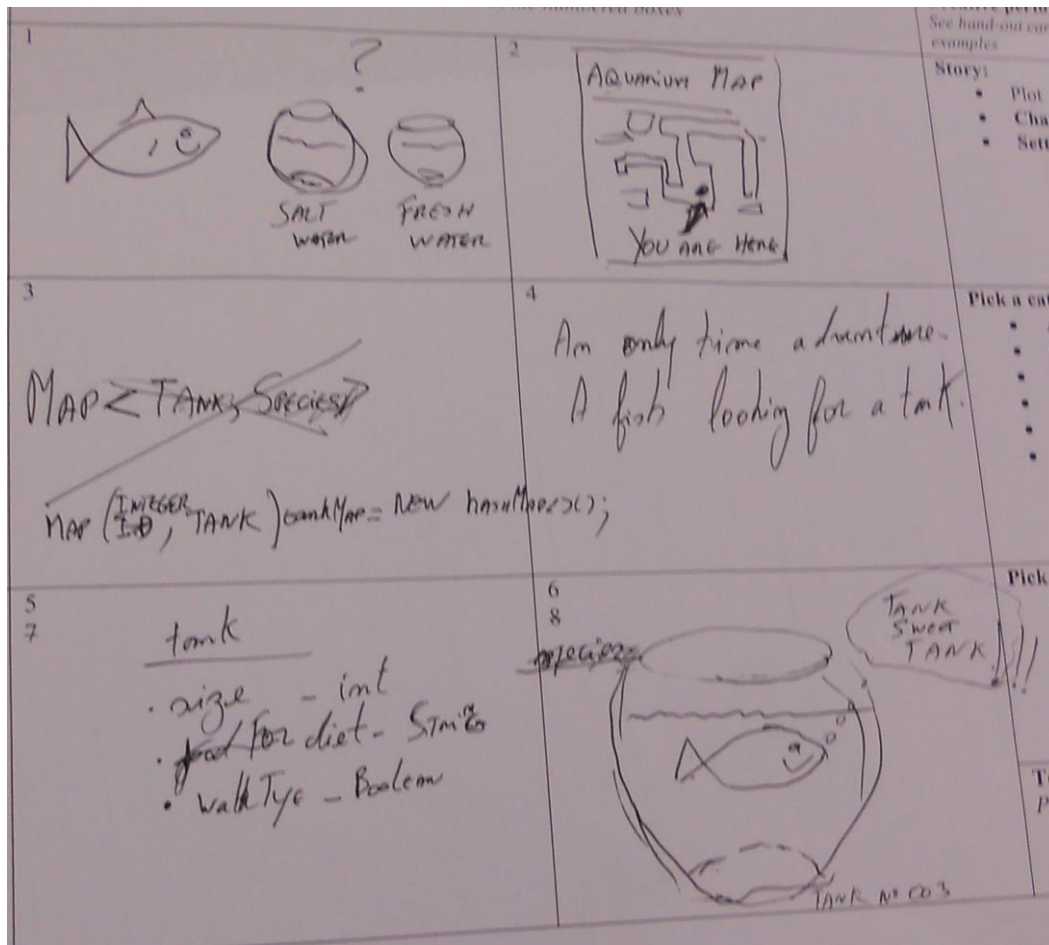


Figure 8: storyboard Group A - a fish called Nemo

The second group (B) had a setting of school lunches, and the characters were students picking lunches and rating them, shown in Figure 9: storyboard Group B - school meals.

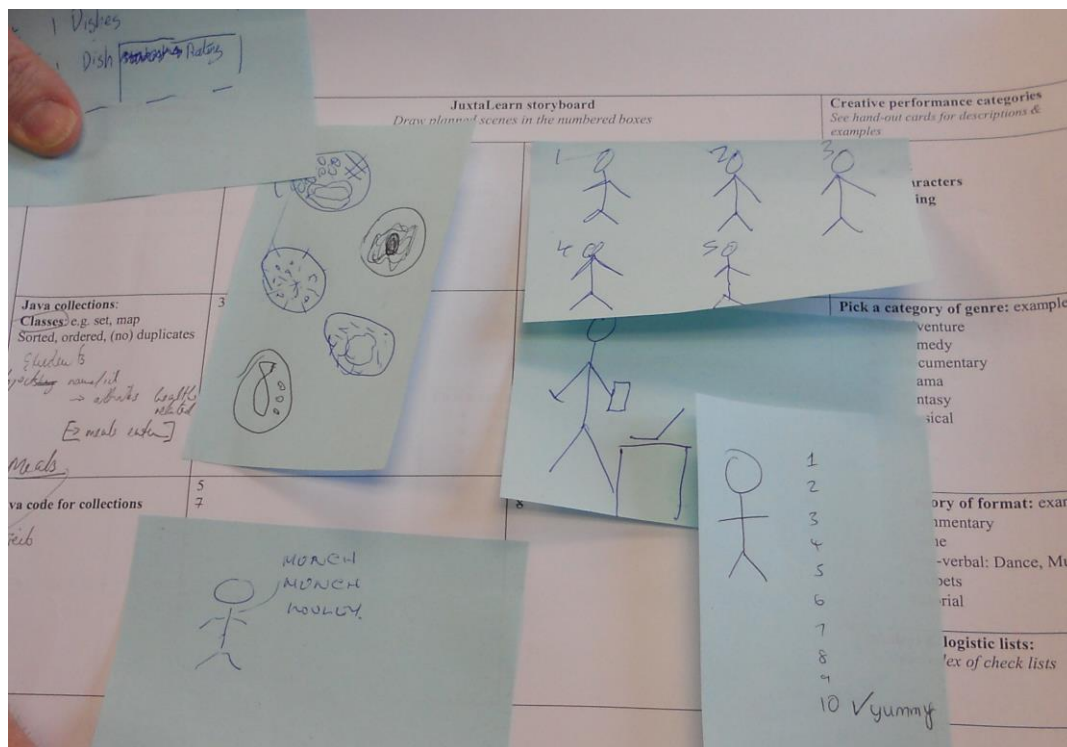


Figure 9: storyboard Group B - school meals

Both groups spent about 40 minutes discussing the problem and developing their scenarios. Observation showed group A laughed and smiled; group B was quieter sometimes apparently not speaking but staring at several blank storyboards. When group A came to present, they had a narrator and someone who represented the fish, saying this was a trout in a set of animals, who wants to go on holiday and has requirements with constraints such as no wolf, and must have sweet water. When group B presented, they described the scenario as a plan for school dinners, with options of five dishes, and a collection of students. The dishes hold a set of ratings. However, having no plot, their presentation was closer to the teacher's example teaching activity. Afterwards one of the students commented that group A's presentation was fun but that group B's was more useful.

Subsequent class discussion revealed a problem of understanding differences between classes and objects, or at least some problem of using the terminology. This difference is a recognised threshold concept (Meyer and Land, 2006, Ragonis and Ben-Ari, 2005), but the tutor had anticipated that earlier study of this concept would have removed it as a stumbling block. Therefore, that discussion revealed students' problems to the tutor, allowing her to deal with them.

Both groups appeared to learn, but had the full JuxtaLearn process been available, then group A's performance on a large screen display might engage viewers more than group B's. The difference was the existence of an identifiable character in the performance of group A, a character with a problem, which made a plot. However, the longer JuxtaLearn

process would encourage both groups to go further into writing their script and the performance steps of pre-production and production during which process the groups would be discussing and refining not only their performance but also their learning.

At the end of the two-hour session, students left short anonymous feedback on post-its. The late student stayed behind, and commented on the presentation that she now felt more confident, realising others did not know much more than her. Other written feedback included:

“I enjoyed the storyboarding exercise”

“Exposed the holes in my knowledge”

“Very entertaining (interfaces explanation)”

“Confirmed and clarified a few things on collections”

“Working out an example in a group”

“Enjoyed the interactions with the class and the assisted peer learning”

“Would have liked a bit more about declaring & assigning sets, a worked example of sets & classes”

“I would have liked more questions & answers – maybe not from existing module materials”

“I enjoyed the use of the “non-standard” methods and props. I did not enjoy the [unreadable] group work”

Tutor note:

“I did this with students a few weeks ago and in them creating their alternative scenarios they came up with a whole load of questions and elicited too from the other group, questions on the topic of study. As a teacher, I learned how the students think, which is important to teaching and learning. You don’t find how they think if you just present, but when they give their presentation and get it wrong but not getting it wrong by themselves - they talk to each other - the whole process helps them learn.”

Learning points for orchestrating performing

- Students need a *JuxtaLearn* storyboard template to support creativity
- *JuxtaLearn* storyboard contents should include stumbling blocks *and* prompts for creativity
- Combine students into small groups in order to allow all of them to participate.
- Students should develop a setting and characters with goals and obstacles to achieving the goals.

5. REFERENCES

- ALPAY, E., CUTLER, P. S., EISENBACH, S. & FIELD, A. J. (2010) 'Changing the marks-based culture of learning through peer-assisted tutorials'. *European Journal of Engineering Education*, 35, 17-32.
- AYLING, P. (2012) 'Learning through Playing in Higher Education: Promoting Play as a Skill for Social Work Students'. *Social Work Education*, 31, 764-777.
- BIGGS, J. B. & AUSTRALIAN COUNCIL FOR EDUCATIONAL RESEARCH, H. (1987) *Learning Process Questionnaire Manual. Student Approaches to Learning and Studying*, ed.
- BODEN, M. A. (2003) *The creative mind : myths and mechanisms*, 2nd ed, London, Routledge.
- BOUD, D., COHEN, R. & SAMPSON, J. (1999) 'Peer Learning and Assessment'. *Assessment & Evaluation in Higher Education*, 24, 413-426.
- BUTERA, F. (2010) Socio-cognitive conflict and learning: past and present. *Proceedings of the 9th International Conference of the Learning Sciences - Volume 2*. Chicago, Illinois, International Society of the Learning Sciences Available at
- CARLILE, P. R. (2002) 'A Pragmatic View of Knowledge and Boundaries: Boundary Objects in New Product Development'. *Organization Science*, 13, 442-455.
- CARLILE, P. R. (2004) 'Transferring, Translating, and Transforming: An Integrative Framework for Managing Knowledge Across Boundaries'. *Organization Science*, 15, 555-568.
- CLOUGH, G. (2014a) *JuxtaLearn Tricky Topic Tool* [Online]. Clough. Available at <https://vimeo.com/109829640> Accessed 29 Apr. 2015.
- CLOUGH, G. (2014b) *JuxtaLearn Video Creation Workshop 09Jul14*. [Online]. Vimeo. Available at <https://vimeo.com/109827064> Accessed 29 Apr. 2015.
- COLLINS, T., MULHOLLAND, P. & GAVED, M. (2012) Scripting personal inquiry. IN LITTLETON, K., SCANLON, E. & SHARPLES, M. (Eds.) *Orchestrating Inquiry Learning*. London and New York, Routledge.
- DICE CONSORTIUM (2008) *Drama Improves Lisbon Key Competences in Education* [Online]. Available at http://www.dramanetwork.eu/about_dice.html Accessed 5 Sep. 2014.
- DILLENBOURG, P. & HONG, F. (2008) 'The mechanics of CSCL macro scripts'. *International Journal of Computer-Supported Collaborative Learning*, 3, 5-23.
- DILLENBOURG, P. & TCHOUNIKINE, P. (2007) 'Flexibility in macro-scripts for computer-supported collaborative learning'. *Journal of Computer Assisted Learning*, 23, 1-13.
- GOLDSMITH, R. (2010) Script to screen. *T156*. UK, The Open University Available at <http://www.catchermedia.co.uk/Discover/Film%20School/>.
- HARTNETT, E., GOLDSMITH, R., JOSÉ, R. & MALZAHN, N. (2013a) D3.2: Performance framework. IN SEVENTH FRAMEWORK PROGRAMME (Ed.) *JUXTALEARN: Juxtapositioned reflective performance enabling science and technology learning*. Milton Keynes, EU and Open University Available at
- HARTNETT, E. J., ADAMS, A. & MALZAHN, N. (2014) D3.4: Use case workshops. IN SEVENTH FRAMEWORK PROGRAMME (Ed.) *JUXTALEARN: Juxtapositioned reflective performance enabling science and technology learning*. Milton Keynes, EU and Open University Available at
- HARTNETT, E. J., GOLDSMITH, R. & ALISSANDRAKIS, A. (2013b) D3.3: reflective performance specification. IN SEVENTH FRAMEWORK PROGRAMME (Ed.) *JUXTALEARN: Juxtapositioned reflective performance enabling science and technology learning*. Milton Keynes, EU and Open University Available at

- HOVARDAS, T., TSIVITANIDOU, O. E. & ZACHARIA, Z. C. 'Peer versus Expert feedback: An investigation of the quality of peer feedback among secondary school students'. *Computers & Education*.
- JAMES, P. D. (2014) *P.D. James: About the Author P.D. James* [Online]. Random House. Available at <https://www.randomhouse.com/features/pdjames/guardian.html>. Accessed 4 Mar 2014.
- LAHAD, M. (2000) *Creative supervision : the use of expressive arts methods in supervision and self-supervision*, ed, London ; Philadelphia, PA, Jessica Kingsley Publishers.
- LAZZARI, M. (2009) 'Creative use of podcasting in higher education and its effect on competitive agency'. *Computers & Education*, 52, 27-34.
- MEYER, J. & LAND, R. (2006) *Overcoming barriers to student understanding : threshold concepts and troublesome knowledge*, ed, Abingdon, Routledge.
- PEGNUM, M., BARTLE, E. & LONGNECKER, N. (2015) 'Can creative podcasting promote deep learning? The use of podcasting for learning content in an undergraduate science unit'. *British Journal of Educational Technology*, 46, 142-152.
- RAGONIS, N. & BEN-ARI, M. (2005) 'A Long-Term Investigation of the Comprehension of OOP Concepts by Novices'. *Computer Science Education*, 15, 203-221.
- STEPHENS, G. J., SILBERT, L. J. & HASSON, U. (2010) 'Speaker-listener neural coupling underlies successful communication'. *Proceedings of the National Academy of Sciences of the United States of America*, 107, 14425-14430.
- WRIGHT MILLS, C. (1959) *SOCIOLOGICAL IMAGINATION*, ed, Oxford University Press.