



D2.3 TRAINING SCHEME AND IMPLEMENTATION SCENARIOS

D2.3 CREAT-IT Training Scheme and implementation scenarios

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Short Description:

Generic Frameworks and Guidance for teacher training events and science lessons using the 12 Pedagogical Principles and the IBSE Phases.

An example of a completed plan is given below.

List of Recipients:

- EU
- Consortium members



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1. Executive Summary

There are two main aspects to this deliverable:

1. Guidance on how to approach the planning and delivery of training events for teachers using the scenarios described in this project (see D2.1); and the generic framework which brings together the 12 CREAT-IT Pedagogical Principles with the five IBSE phases.
2. The presentation of a generic framework for teachers to refer to when planning their teaching for their pupils in school.

1.1 Planning and Delivering Training Events for Teachers

In this deliverable the focus is on applying the pedagogical principles identified in D2.1 to the practical situation of training events for teachers within the framework created by the CREAT-IT Team. Through the review of literature and the various survey activities we have developed a picture of the characteristics and qualities of a creative science teacher. We recommend, that in teacher education contexts (both for initial and continuing development activity) there should be opportunities for teachers to acquire knowledge and understanding of these characteristics and to adopt them in their own practice.

Adult learning theory (andragogy) proposes that:

- Adult learners bring a great deal of experience to the learning environment. Educators can use this as a resource.
- adults expect to have a high degree of influence on what they are to be educated for, and how they are to be educated
- the active participation of learners should be encouraged in designing and implementing educational programs



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- adults need to be able to see applications for new learning
- adult learners expect to have a high degree of influence on how learning will be evaluated
- adults expect their responses to be acted upon when asked for feedback on the progress of the program

(Knowles,1990 in Dunn, 2013 (online))

In many ways we would argue that in creative learning contexts these same principles apply to pupils and are certainly integrated in the 12 CREAT-IT Pedagogical Principles used in this project. And, while our pupils might not expect to have ‘a high degree of influence’ on the educative process we are arguing that they should certainly have more.

Creating opportunities for professional development is best done through a combination of modelling and demonstration; opportunities to engage with new ideas through debate and discussion; reading and personal reflection; putting new approaches and ideas into practice over time, with the opportunity for peer to peer observation and feedback (Garet, et al. 2001; Darling-Hammond, in Pressiesen 2008). The trainer can take different roles in this process ranging from instructor to enabler; co learner to mentor (Chappell and Craft , 2009)

In addressing the aims of this project it is important to emphasise the need for training events undertaken by consortium members and other teacher trainers, to emulate and reflect the principles of creative pedagogies that we have identified, in the way sessions are planned and delivered. Thus – teacher participants should be given opportunities to learn through a ‘hands on’ approach: engaging with the experiences and practices they will be using with their pupils. Of course, it is almost always the case that teachers’ workshops and courses have to be completed in much less time than is required or expected for pupils’ learning – so timing and pace often have to be shorter and faster (more intensive) than normal, but it should still be



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possible for teachers to gain a good understanding of the principles, aims and processes in focus.

A successful training event for teachers will share many of the features of a successful lesson for pupils with a balance of theory; practical applications; time to reflect and consolidation. Teachers come with a wide range of professional experience and discipline knowledge backgrounds, which should be acknowledged and exploited in the learning process. This is particularly important when working with primary teachers who may not view themselves as specialists in either science or the arts, and may lack confidence to work in new ways with these subjects (Hennessy et al 2001; Appleton, 2003). However, due to the nature of primary curricula, one can presume that primary generalists are more used to using cross curricular approaches. On the other hand, secondary teachers may tend to be more comfortable staying close to their specialist subject and could find the idea of using the arts in their teaching quite unfamiliar.

The scenarios for training offered in this project have been developed and refined over several years and can be used in their entirety as extended projects with pupils forming a unit or project of several sessions or taking a term. This might offer the opportunity for science and arts teachers in a school to collaborate.

Equally, particular aspects of the scenarios may stimulate small scale activities or shifts in approach in the context of an individual teacher's teaching: such as, thinking about how drama strategies might be used to provoke discussion about ethical issues; or using visual art or songwriting to communicate understanding of a theory or process.



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If a genuinely creative, dialogic and collaborative approach is adopted within these training sessions (see principles of Dialogue and Collaboration in the 12 CREAT-IT Pedagogical Principles) then it should be possible to provide professional development that gives teachers the confidence and motivation to engage with new approaches to teaching.

1.2 Suggested Elements and Structure for Training Events

Some or all of the 12 CREAT-IT Pedagogical Principles and the IBSE phases should be visible in the way participants have been asked to work.

- i. Pre session tasks and material can help to orientate the participants, and engage their interest in and thinking about the content. Tasks might involve reading a text related to creativity in education; bringing an example of a lesson plan or resource that relates to the focus of the training; reflecting on how science is taught in their school, etc (1. Professional Wisdom). The outcomes of the task can then be exploited in the training event.
- ii. Consider short initial getting- to- know- you activities that have a playful quality (3. Risk, immersion and play) – setting the tone for the session and encouraging collaboration and interaction (2. Individual, collaborative and communal activities for change). This can also provide a lot of information about who is in the group, their expertise and disposition towards the session. Such activities can help the workshop leader/s adapt their plan in the flow of the session.
- iii. Present the aims for the session – Ask the participants to write down what they hope to learn from the training (8. Discipline knowledge) and share comments via an anonymous graffiti board (see xi below).



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- iv. The identification and selection of the science content may be made in advance but may also be chosen by the group as a whole, or by sub groups, depending on how the session is to be structured (8. Discipline knowledge, 1. Professional wisdom, 5. Dialogue). All groups could work on their own interpretation of the same scientific question/theory or find their own (7. Interrelationship of different ways of thinking around a shared 'thread' or 'throughline').
- v. To reduce anxiety and establish a sense of trust and shared experience, consider asking the participants to agree on some 'rules of engagement' (e.g. it's OK to make mistakes; if something makes you uncomfortable you can sit out and watch, etc.).
- vi. If teachers are being asked to do new things (create music, sing, move etc.), always include the opportunity for participants to think through ideas or try things out in pairs or small groups before sharing or showing more widely (4. Different ways of knowing).
- vii. Presenting the generic framework does not need to come first (6. Relationship between 'bottom up' and 'top down') – it can be useful to start with the practical ways of working you want to develop and at a later stage give a talk and/or have a discussion about the principles behind the practice (3. Risk, immersion and play, 5. Dialogue). In this way participants can immediately make connections between the principles and practice by reflecting back.
- viii. Give participants time to develop their ideas and responses to creative tasks collaboratively (3. Risk, immersion and play).



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- ix. When sharing creative or other outcomes, structure this so that participants can self and peer evaluate (1. Professional wisdom, 5. Dialogue) – and through this process can identify criteria for assessment (e.g. how to ask good questions; constructive feedback; challenges to deepen or develop thinking).
- x. Allow time for participants to raise concerns about, for instance, application to their own classrooms, working with colleagues, negotiating with senior management; fulfilling assessment requirements (5. Dialogue). This is not about the workshop leader/s having all the answers but opening up the discussion for participants to support each other, too.
- xi. Evaluate the session with the participants at the end of the session (5. Dialogue). This is likely to be much more effective than trying to get feedback after they have left. Graffiti boards (see <https://www.facinghistory.org/for-educators/educator-resources/teaching-strategies/graffiti-boards>) or other ways of collecting anonymous comments, are useful – this can be structured by asking for good points; aspects that were not useful, new questions etc.
- xii. It is proposed that all attendees to the teacher workshops would be able to access further support online via the CREAT-IT website to share their experiences and ask further questions. Non-attendees to the CREAT-IT workshops will also be able to access the website to find out further information about the CREAT-IT training.



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1.3 Training Workshop: Generic Structure Map





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2. Framework for planning and teaching science using creative approaches

The following framework brings together the 12 CREAT-IT Pedagogical Principles with the five IBSE phases providing a guide for teachers when planning and teaching lessons that promote and support creative approaches to learning in science.

The framework shows how each IBSE phase can be developed using the relevant principles and giving exemplifying material (activities and key questions). The first column provides examples of activities that support each stage of a lesson relating to the IBSE phase. The second column provides questions that teachers could ask their pupils in order to stimulate their thinking within the suggested activities. It would be worthwhile at this stage for the pupils to keep a record of answers to this questions, as their answers may provide stimulus and a bridge between the scientific exploration and the later artistic creation. Column three shows how the 12 CREAT-IT Pedagogical Principles are connected to the activity, and column four offers questions for the teachers, aimed at prompting their thinking when planning and reflecting upon the benefits or success of the task set. The final column suggests ways in which teachers could include social media in their lesson.

It is expected that teachers would use this detailed framework to help plan their sessions using the CREAT-IT planning template on page 17.

The presentation of the framework is structured around the five IBSE phases suggested by Cosmos (2008):

Phase 1: Question Eliciting

Phase 2: Active Investigation

Phase 3: Creation

Phase 4: Discussion

Phase 5: Reflection



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Sample Activity	IBSE Questions for pupils	12 CREAT-IT Pedagogical Principles	12 Pedagogical Principles Questions for teachers	Social Media
<p>The Graffiti wall</p> <p>Considering the chosen topic or theme, pupils develop questions they have regarding the topic: this could be done individually, or discussed in pairs or small groups</p> <p>Pupils write their suggestion on a postit note or write directly on to the graffiti wall</p> <p>Questions are then discussed, filtered and categorized by the class</p>	<p><i>What would you like to know about...?</i></p> <p><i>What would you like to find out about...?</i></p>	<p>4. Different ways of knowing</p> <p>5. Dialogue</p> <p>12. Empowerment and agency</p>	<p><i>How might this activity foster a sense of agency in both adults and children?</i></p> <p><i>How might a teacher foster a question-posing space for pupils to be able to articulate what scientific issues they are interested in?</i></p> <p><i>How can you ensure all pupils play an active role in discussing the topic?</i></p>	<p>Pupils create a blog to communicate the process they go through during the investigation. They will be able to share content and open up debate with others along the journey</p> <p>Pupils pose their questions on Twitter for feedback. https://twitter.com</p>

2.1 Phase 1 - Question Eliciting: Exhibit Curiosity





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Sample Activity	IBSE Questions for pupils	12 CREAT-IT Pedagogical Principles	12 Pedagogical Principles Questions for teachers	Social Media
<p>Pose, pause, pounce, bounce (Harrison & Howard, 2009)</p> <p>Teacher poses a question from the box, pause and allow time for the class to think, pounce (chooses) on a student to answer the question, the pupils bounce (share) their answer to another student to develop the thought further.</p> <p>Repeat the task until a set of rich questions is gathered.</p> <p>Plan investigation</p> <p>After the discussion, pupils select one of the posed questions and begin to plan their investigation</p>	<p><i>What do you want to find out?</i></p> <p><i>Can you invent...?</i></p> <p><i>What approach would you use to...?</i></p> <p><i>What kind of experiment or observation might work best for your investigation?</i></p> <p><i>How will you record your results?</i></p> <p><i>What do you expect to see happening?</i></p> <p><i>What is your prediction?</i></p>	<ol style="list-style-type: none"> 1. Professional wisdom 2. Individual, collaborative and communal activities for change 3. Risk, immersion and play 4. Different ways of knowing 7. Interrelationship of different ways of thinking around a shared 'thread' or 'throughline' 9. Possibilities 12. Empowerment and agency 	<p><i>How might this activity foster a sense of agency in both adults and children?</i></p> <p><i>How can shared throughlines be identified around which multiple ways of thinking can be fostered?</i></p> <p><i>What ways of thinking might be used to engage with a throughline?</i></p> <p><i>How can the arts facilitate collaborative learning?</i></p> <p><i>Considering the questions asked by the pupils, how can you help them to structure the activity so that all participants have a role?</i></p> <p><i>How can you support your pupils to take risks in their thinking?</i></p>	<p>Pupils collaborate their planning using Glogster http://edu.glogster.com/?ref=com</p>

2.2 Phase 2 - Active Investigation: Propose Preliminary Explanations or Hypotheses





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Sample Activity	IBSE Questions for pupils	12 CREAT-IT Pedagogical Principles	12 Pedagogical Principles Questions for teachers	Social Media
<p>Conduct investigation</p> <p>Pupils conduct the investigation they have planned based on one of the questions they have chosen.</p>	<p><i>What do you observe?</i></p> <p><i>What can you see?</i></p> <p><i>What do you expect to see?</i></p> <p><i>Why do you think this is happening...?</i></p> <p><i>How would you explain...?</i></p>	<p>1. Professional Wisdom</p> <p>5. Dialogue</p> <p>8. Discipline knowledge</p> <p>9. Possibilities</p> <p>11. Importance of materials</p>	<p><i>How do resources and environment influence pupils' choices and support their learning?</i></p>	<p>Pupils document their investigation with video and photos to share on websites to open up further debate and feedback, they utilize these comments in their reflection</p>
<p>Observe investigation</p> <p>Pupils observe their experiment and collect evidence this can be written, photographic or video.</p>	<p><i>How is... related to...?</i></p> <p><i>What examples can you find to...?</i></p> <p><i>How would you organize... to answer...?</i></p>			
<p>Record results</p> <p>Pupils record the results from their experiment.</p>	<p><i>What is expected/ unexpected?</i></p> <p><i>Can you think of a different /interesting way to answer your question?</i></p>			
<p>Analyze and Interpret results</p> <p>Pupils analyze their results and interpret their data.</p> <p>At each stage of the investigation support the pupils by posing questions and prompting thinking.</p>				

2.3 Phase 3 - Creation: Gather Evidence from Observation





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Sample Activity	IBSE Questions for pupils	12 CREAT-IT Pedagogical Principles	12 Pedagogical Principles Questions for teachers	Social Media
<p>Evaluation</p> <p>After conducting their investigation pupils record their evaluation</p>	<p><i>How can you explain and interpret the results?</i></p> <p><i>What is the relationship between...?</i></p> <p><i>Would it be better if...?</i></p>	<p>5. Dialogue</p> <p>9. Possibilities</p>	<p><i>Could the arts provide a vehicle for the pupils to present their findings? Could this elicit better understanding?</i></p> <p><i>How can the arts help pupils to engage in dialogue?</i></p> <p><i>Can the arts be used to promote debate with an audience?</i></p> <p><i>How could pupils use the arts to interpret the results</i></p> <p><i>How can the arts be used to explain any further questions the pupils have about the topic?</i></p>	<p>Share video of discussion on Youtube to open up further discussion within the community.</p> <p>Conduct the discussion with video / audio conferencing so that more participants can be involved.</p> <p>Post images of the work taken on Instagram, Twitter for comment.</p> <p>Present results online using Prezzie or Glogster.</p> <p>The Science Cafe event is streamed on the internet.</p>
<p>Presentation of the results and discussion of the findings</p> <p>Groups present their results, this could take many forms, present to the class or a different audience i.e. parents, other classes, school assembly, a festival, or as an online.</p>	<p><i>What information would you use to support your view?</i></p> <p><i>What remains unclear?</i></p>			

2.4 Phase 4 - Discussion: Explanation Based on Evidence





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Sample Activity	IBSE Questions for pupils	12 CREAT-IT Pedagogical Principles	12 Pedagogical Principles Questions for teachers	Social Media
<p>Reflection</p> <p>Pupils conduct a reflection, this could be done as a self reflection or peer reflection</p>	<p><i>How does the result relate to your original idea / prediction?</i></p> <p><i>Do you agree with the outcome / result...why?</i></p> <p><i>How would you adapt... to create a different result?</i></p> <p><i>Can you formulate a theory as why this happened?</i></p> <p><i>Has your thinking changed?</i></p> <p><i>What new question could you ask?</i></p>	<p>6. Relationship between 'bottom up' and 'top down'</p> <p>9. Possibilities</p>	<p><i>Do the arts help to clarify and communicate understanding?</i></p> <p><i>How can pupils use the arts to record / document their self-reflection or peer reflection?</i></p>	<p>Pupils Write a blog post sharing their reflection with others in the community for feedback and further debate.</p> <p>Pupils Prepare an online self-reflection presentation using Prezzie, Glogster, Scoopit.</p>

2.5 Phase 5 - Reflection: Communicate Explanation





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3. Generic session template for trainers and teachers

Alongside the above detailed Generic Framework which teachers and trainers may refer to when planning a lesson or workshop, the CREAT-IT team have also produced a generic session template to support said planning

Using the framework the example below demonstrates a creative approach to the teaching of the science topic 'Properties and changes of materials' utilizing drama activities to support the approach. The template explains the project objectives and what the pupils expected outcomes are for each session.

Section 5 contains further suggestions for creative ideas to teach the topic 'Properties and changes of materials' through the arts.

4. CREAT-IT Planning Template

Case Study Approach: WASO / Junior Science Cafe / Science Theatre / Other		
<p style="text-align: center;">Science unit topic</p> <p style="text-align: center;"><i>Properties and changes of materials¹</i></p> <p style="text-align: center;">Class information</p> <p>Year Group: 5 Age range: 8-9 Sex: mixed Ability: mixed</p>	<p style="text-align: center;">Materials and Resources</p> <p><i>What do you need? Selection of everyday objects</i></p> <p><i>Where will the learning take place? On site or off site? In several spaces ?(e.g.science laboratory, drama space etc), or one? Science Lab and Drama Classroom</i></p> <p><i>Health and Safety implications?</i></p> <p><i>Technology?</i></p> <p><i>Teacher support? (e.g team teaching with arts and science expertise)</i></p>	
<p>Pupils were taught</p>	<p style="text-align: center;">Prior knowledge</p>	
<div style="border: 1px solid red; border-radius: 15px; padding: 10px; margin-bottom: 10px;"> <p><i>What do pupils know and understand of the science topic?</i></p> <p><i>What relevant arts skills and knowledge do they have?</i></p> </div> <p><i>To compare and group materials together, according to whether they are solids, liquids or gases.</i></p> <p><i>To observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius.</i></p> <p><i>To identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.</i></p>		
<p style="text-align: center;">Individual session project objectives <i>(What do you want pupils to know and understand by the end of the lesson?)</i></p> <p>Session 1: <i>Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets</i></p> <p>Session 2: <i>Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution. Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic</i></p> <p>Session 3: <i>Demonstrate that dissolving, mixing and changes of state are reversible changes. Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.</i></p>		
<p style="text-align: center;">Assessment</p> <p><i>How will you assess the pupils' understanding?</i></p> <p><i>How will you record this?</i></p>	<p style="text-align: center;">Differentiation</p> <p><i>How can the activities be adapted to the needs of individual pupils?</i></p>	<p style="text-align: center;">Key Concepts and Terminology</p> <p style="text-align: center;"><i>Properties Hardness Solubility</i></p> <p style="text-align: center;"><i>Transparency Conductivity Dissolve</i></p>

¹ Prior Knowledge and session objectives taken from Department for Education (DfE) (2013) Science programmes of study: key stages 1 and 2 National curriculum in England [online] available from <https://www.gov.uk/government/publications/national-curriculum-in-england-science-programmes-of-study> [retrieved 11th September 2013]

Session 1 Planning: Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets.

IBSE Activity	Potential arts activity	Student	Teacher	12 CREAT-IT Pedagogical Principles
Phase 1: Question Eliciting	<i>Hot seating (Drama): pupils ask their questions to a designated “expert” in the field of every day materials. Pupils take it in turns to be the expert</i>	<i>Pupils think about questions they have regarding the properties of everyday materials</i>	<i>Provide pupils with the everyday objects to sort and classify</i>	Highlight the relevant principles <ol style="list-style-type: none"> 1. Professional wisdom 2. Individual, collaborative and communal activities for change 3. Risk, immersion and play 4. Different ways of knowing 5. Dialogue 6. Relationship between ‘bottom up’ and ‘top down’ 7. Interrelationship of different ways of thinking around a shared ‘thread’ or ‘throughline’ 8. Discipline knowledge 9. Possibilities 10. Ethics and trusteeship 11. Importance of materials 12. Empowerment and agency
Phase 2: Active Investigation		<i>Pupils plan how they will test the properties of the everyday materials</i>	<i>Support pupils by asking further questions to prompt thinking</i>	
Phase 3: Creation	<i>Pupils record their process using photographs, video, audio recordings. This material can then be used to enhance a dramatic scene</i>	<i>Pupils conduct an investigation to test the properties of everyday materials</i>	<i>Support pupils through questions, guidance and provision of resources</i>	
Phase 4: Discussion	<i>Prepare a drama that explains and interprets their results. Create dramatic scenarios that illustrate how reversible or non-reversible changes affect our lives and the environment.</i>	<i>Using the arts pupils prepare and present their results for discussion</i>	<i>Assess pupil’s knowledge</i>	
Phase 5: Reflection	<i>Pupils evaluate their project and consider “how well did the drama process support their learning?”.</i>	<i>How successful was their investigation. What would they change to improve the reliability of their results?</i>	<i>Assess pupils’ understanding</i>	



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5. Potential arts related activities

5.1 *Drama, Theatre, Music and Dance.*

- Create a dramatic scene or opera – this could be in response to the questions asked by the pupils.
- Depending on the science topic, as a stimulus, pupils present any issues, ethical concerns or consequences surrounding this topic as a story line for a dramatic scene or a song to communicate understanding and conflicting views about the topic.
- Pupils could create a piece of theatre or music about the history of scientific discoveries. Pupils would develop their work for performance using design, sound and lighting etc.
- Explore through music or movement how the scientific properties of materials and the process of change (whether reversible or not) - can be shown
- Write a poem or haiku about the investigation
- Create a dance motif demonstrating the theory learnt and behaviour observed during the investigation

5.2 *Art*

- Take photographs/video/ audio recordings during experiments to capture materials in the process of change. Use this material to create multimedia presentation or a stop motion video demonstrating the process.
- Record observations in drawings or print.
- Use the materials produced as a result of the investigation to paint and draw with for example painting with soil, melted chocolate, charcoal, molding the plastic or wax into new objects.
- Create a sculpture with the everyday materials before and after the investigation.



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6. Summary

In Work Package 3 the focus will be on how this framework can be implemented using the three scenarios that will form the basis for the planned training events. In both CPD and classroom contexts there must be a significant degree of agency and flexibility in how educators approach their own work. Time, working conditions, curriculum constraints and the abilities, expectations and dispositions of learners will all contribute to the choices about the nature of the activities, degrees of risk (for teacher and pupils) and the emphasis on different 12 CREAT-IT Pedagogical Principles. Above all we hope that educators will be motivated to engage with these ideas and explore new aspects of practice.



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