Creativity, Arts and Science in Primary Education

Training Material

Content

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The CASE Project and Inquiry based science education

In CASE, primary teachers are agents of change.

Dear teacher,

This document is a template which the CASE project places at your disposal in order to encourage you to plan, document and communicate creative teaching sequences. In CASE, science and the arts are intertwined. Based on pre-existing creative CASE materials, we would like to invite you to take the exciting journey of developing your own ideas for how your classroom may *feel*.

CASE aims to empower teachers' profession with skills and competencies which will enable them to widen their teaching capabilities by strengthening creativity in the classroom. Our approach to creativity lies at the intersection of science and art in education.

Inquiry Based Science Education (IBSE) is a method of teaching and learning that focuses on use of questions, problems, and educational scenarios used to engage students in concepts of science and support their acquisition of scientific knowledge and skills. This is achieved through their **active participation** in activities that make sense to the students, chiefly due to the fact that they are largely initiated by those students. Students understand in-depth the scientific concepts through their own perception of the world that surrounds them and through their own experiences and reflective processes.

In CASE, science and the arts are intertwined. The interaction between these fields within IBSE requires creative solutions on the part of both students and teachers, and enables new ways of thinking about the science curriculum, as shown below.

Various approaches have been developed for IBSE implementation. In CASE, a core cycle of query, evidence collection, analysis, explanation, connection, communication and reflection (see Figure 1) is adopted, based on previous initiatives in the field (e.g. the CREATIONS project[1]).

[1] www.creations-project.eu / H2020-EU Project reference: 665917

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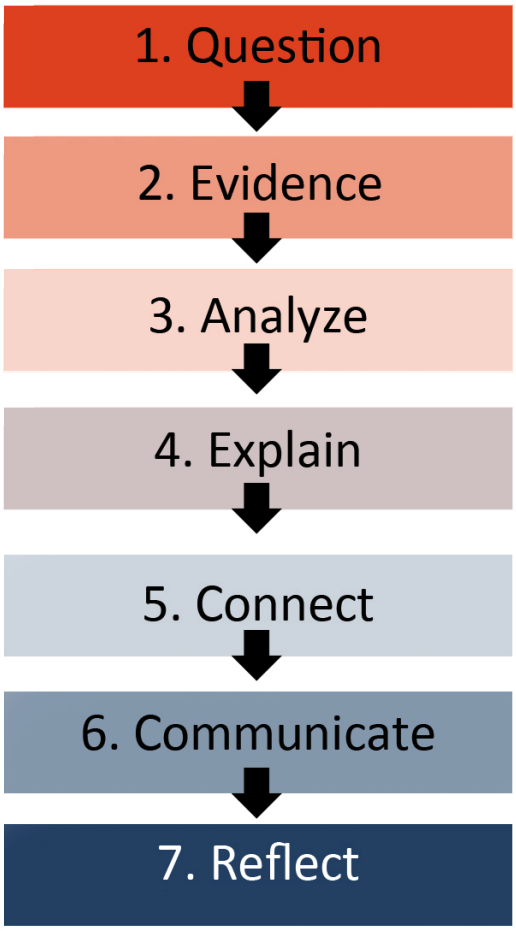

Figure 1: Phases of IBSE

This cycle emphasizes the need for students to engage in creative processes, through which they will act as young scientists and communicate science. In Figure 2, actions that students perform in each IBSE phase are briefly shown.

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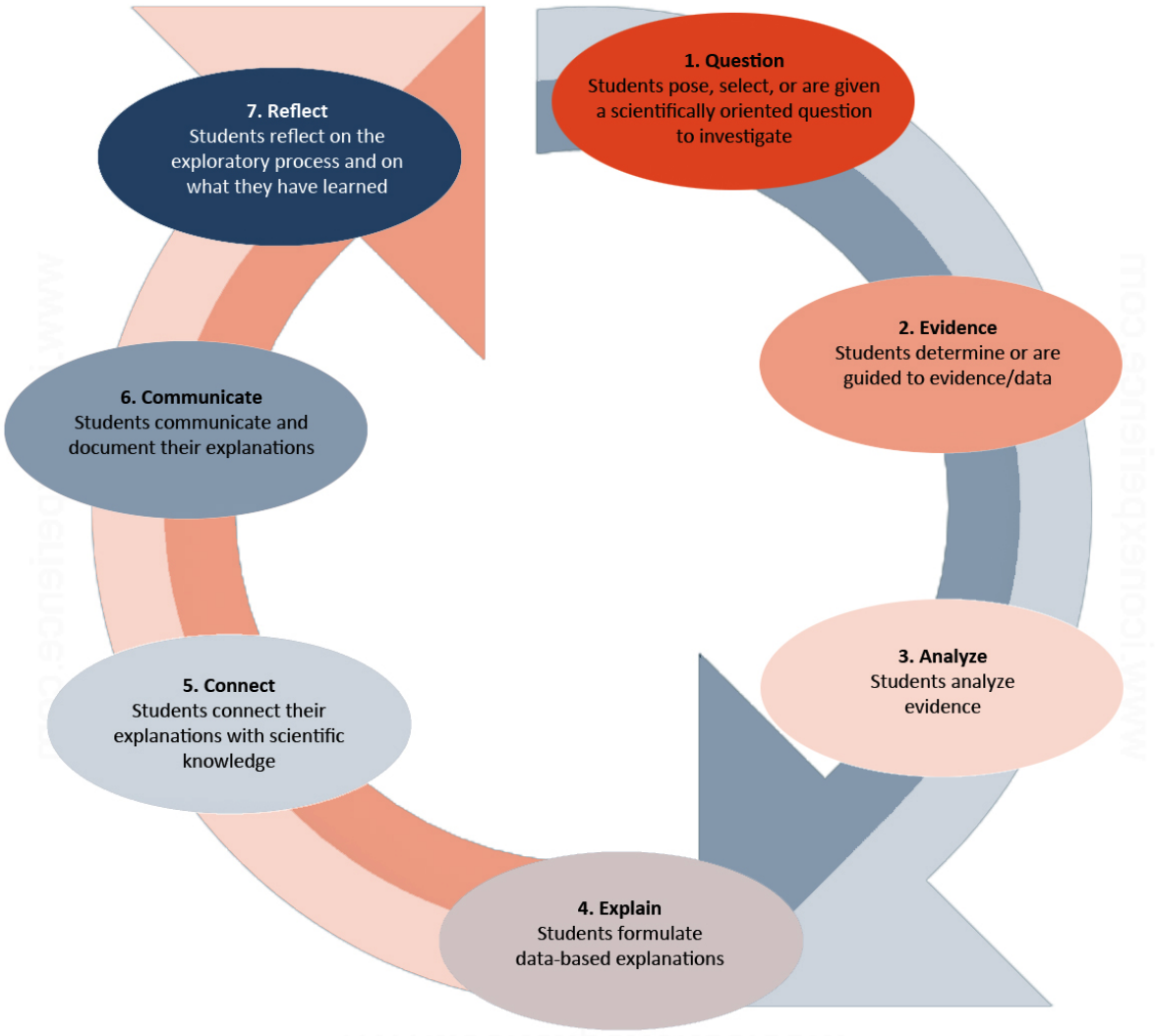

Figure 2: Student actions at each stage of IBSE

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“Learning Science Through Dance” (LSTD)

Some words about the activity

Movement is the way of nature and the essence of science. Learning Science Through Dance (LSTD) gives teachers and students the opportunity to dig deeper into science concepts and phenomena through creative dance and movement. It gives us the opportunity to be creative and investigate with our bodies. Our bodies are one of the strongest memory sources we have and when it comes to children in primary education body language is a strong source to remember and to tell the surroundings what they do and what they understand.

Two of the main foci we have in this LSTD material is reflection and analysis of the source, the science. The tradition of dance is to study details and find reasons to move in a certain way. We find it exciting to connect this with science and educate the students in their own natural way of moving. It also brings the social aspect of education on the table. We connect and need to work together through the process and each student's energy and movements are important. Children speak and express themselves through and with their body. It's a strong expression- sources that the teacher has the opportunity to use in different ways in the education.

Through dance activity and movement exercises given by the teacher, the students will investigate different scientific topics and concepts. These can also be experienced in a science experiment shown by the teacher as an introduction. When we work with movement and dance in LSTD we specifically talk about *creative dance.* The essence of creative dance is for everyone to use their bodies´ natural movement and be free to improvise and structure this movement without using straight counting or classical position and technique.
In this manual we work mainly with science through dance, but it is also possible to work with dance through science. It depends on what type of student group and what the teacher feels fits the school structure at the time. In LSTD the students work and participate individually, in small groups, bigger groups and together with the whole student group. The teacher's main job is to work as a facilitator, help and guide the students through the creative process, to trust the process and allow it to be open and different each time.

Implementation phases

Below we provide a description of the implementation phases of the LSTD activity. This can also be mixed and combined. It is up to the teacher and the students. As a link to the manual we have added a video (link on page 8) that gives you an idea of the process from our latest workshop.

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PHASE 1. QUESTION

KEY CHARACTERISTICS

In this first phase the teacher presents the scientific topic (show a scientific experiment) and open up for scientific questions related to the chosen topic/experiment to be investigated by the students.

EDUCATORS' ACTIONS

SCIENTIFIC TOPIC: (15 min)

1. The teacher has chosen the scientific subject from the curriculum and introduces a scientific experiment for the student. The teacher´s goal of the introduction is to stimulate the students´ attention and make them curious about the chosen phenomen. The teacher could also ask the students to "draw the forms" represented in the experiment, instead of writing them. The first student reflection/analysis/question round should take place in this phase. In this manual and the connected video we have chosen *water* as the scientific topic in our example based study.

GETTING INTO MOVEMENT RELATING TO THE TOPIC: (10 min)

2. The teacher can introduce a movement warm up where he/she gives the student for example 10 seconds in freeze positions. The students use their bodies (individually) to make shapes from the scientific experiment /phenomena. Repeat 3-5 times, different phase experiments, related examples every time. (students can also use their drawings as an inspiration for movements). For example *Ice, DNA, Energy,* etc. In this way the teacher can hold a focus on what is of scientific importance, showing the directions by picking curriculum related phenomenon to the move/shape/freeze exercise.

FIND YOU´RE QUESTION SCIENTIFIC AND MOVEMENT: (25 min)

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The students are divided into focus groups. Each focus group picks 1-3 questions they find relevant to the topic the teacher has assigned to the group. In this phase it is important that the teacher is aware that this shall be experienced and translated into body language. So it helps to focus on movement-related questions such as: "How does gas move and why?", "What types of water do we have in our surroundings?", "Can you describe one phase of the water cycle?", "What is the chemical formula of water?"

STUDENTS ACTIONS

1. SCIENTIFIC TOPIC: (15 min)

   During the first presentation the students are observers. If the teacher has chosen to give them an "take note task" during the science experiment they can draw out the shapes and what they see and use their drawings to explore and ask questions about the experiment. This opens up the creativity to study movement in scientific experience.

2. GETTING INTO MOVEMENT RELATING TO THE TOPIC: (10 min)

   In the second phase of reflection/analysis/question the students are active participants and they could present the movement they saw in the experiment. Or in the warm up they could use the drawings as an inspiration to the 10 second movement/freeze study with their bodies.

3. FIND YOU´RE QUESTION SCIENTIFIC AND MOVEMENT: (25 min)

   The students get into focus groups that the teacher has chosen. They find 1-3 scientific questions with a focus that this will be represented through movement/form/dance. This happens in dialogue with the teacher.

LINKS

https://vimeo.com/user127264734/review/485477752/017c847878

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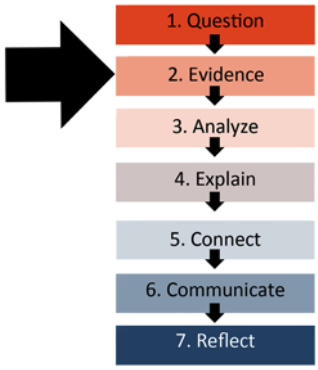
PHASE 2. EVIDENCE



KEY CHARACTERISTICS

In this phase the students work in their groups with the questions they picked in phase 1. Gather information and dig deeper into the chosen phenomenon. The teacher gives direction and guidance. It is very important in this phase to connect movement as a way to explore correct scientific facts.

EDUCATORS' ACTIONS

The teacher gives guidance of where to find information that gives deeper educational knowledge and specific answers to the students' group questions. How this is done is up to the teacher, for example give each group a chapter in the curriculum book or a related website. The teacher hands out the "dance manual" for the students to use actively when researching and structuring their work. If the teacher opens up for the student to try the experiment by themselves, this is the phase to let them do so.
In this part it is important that the teacher has a focus on movement, shape and structure of the students´ new-found knowledge. Colors can also help with this. A good follow up question to the student from the teacher is: *"How could you represent this in movement?"*. This phase may feel a little bit chaotic for the teacher when there is movement and exploration of information simoltaneously in each group. Trust the process and let this part be a little bit loose. (If you have the space it could be a good idea to have the groups separate. Remember that children are used to movement differently and often are more explosive than adults in their exploration.) Let them investegate movements in their own way, and try not to minimize the students energy.

STUDENTS' ACTIONS

The student-groups have their chosen question to investigate deeper. Find facts through the web, get information from the curriculum, teaching books or even do the experiment by themselves (in groups). It is also possible to study one smaller part of the experiment related to the group questions. The students need to study the facts and then start thinking how they can represent this in movements built on the "dance manual".

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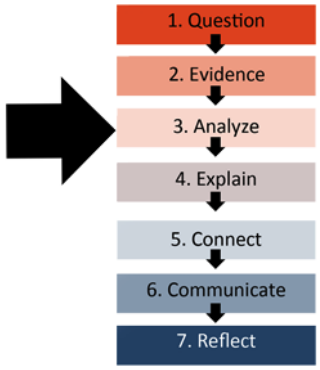
PHASE 3. ANALYSIS



In this phase the students will start putting the collected information and data into a categorization system. This will be the main choreography/dance by using the dance manual. This is the phase where we also do the analysis of the facts and answers to our questions in the form of movement. The students can work in their groups, or maybe the students within the groups have different individuell parts that they wanted to show, whatever works for the group and class related to the time that is given. (This phase often takes more time than we think.)

In this phase it is very important that the teacher has a good overview of all the groups' investigation-questions, so he/ she understands what the students have been working on, and can be a helpful facilitator guiding the students through all the next phases. This is so the students keep focused and not start to make movements not related to the gathered information. Both the teacher and students should use the dance manual as a helping guideline in this phase. The manual will help the student and the teacher to keep the science focus in the chosen movements and also see the structure of how to build a choreography/dance.

The teacher should go around to the groups/students and see how long they come in the choreographic/dance parts. It can be a good idea to ask them to show it. The teacher also gets the chance to ask scientific related questions and reflections of the students' thoughts of why they chose that combination of movement as an answer to their questions.

Remember that not all students find it easy to make movements on the spot. The teacher can show the drawings we did in the 1st phase - warm up, and use this as an inspiration to get the students make related movements. Another way of making movements is to let each student make 3 movements, and then go back to their group and put it together.

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Example: Different phases of water: GAS-WATER-ICE (for this ex. WATER)
All students individually make 3 different types of movement showing WATER.
For example one student chose to do
1. rain drops, sea and waterfall as three different movements.
Another student does:
2. still water, sparkling water and waves as three different movements.
And so on. Then the students go back to their group and share their three movements and put all of them together, so in a group of 4 students they have 12 movements all together as a nice base of movement material (choreography). Then they can mix and match the movements like:
two raindrop movements followed by still sea, that goes over in waves and ends up in a waterfall.

Remember to let the students be creative and playful with their new knowledge. If possible let the students practice in the space /room where they are presenting/sharing, this way the students will feel more secure and detailed in their presentation in the next phases. Remember that the end-result of creative dance can come across differently in different groups. This is why it's important that the teacher play an important part by asking questions in the interpretation process to grasp what they have investigated in and processed.

The students focus on what they have discovered, what new knowledge they want to present and how the group wants to present it in the form of choreography/dance/movement. The first thing they should think of as a group (if they are presenting in groups) is what soundscape they choose. Is it music, noise, something from the experiment ect. Just so this can be in the system of the body before they start playing with movement.

Make three individual movements based on the group topic and focus on this. Before going back to the group to share and analyse the different movements and put them into a choreography/ dance. With guidance from the teacher the group has a scientific reality check of understanding the movements and how to put the movements together.

Important for the student to think of is:
Will the audience that we are presenting our new knowledge to understand or get curious about our chosen scientific topic? (outside perspective)
What is it that the group wants to show with their movement in relation to the scientific facts they have been investigated? (inner perspective)

A part of the exercise should also be to enjoy the creative free mind that makes our brains and minds develop new ways of thinking.

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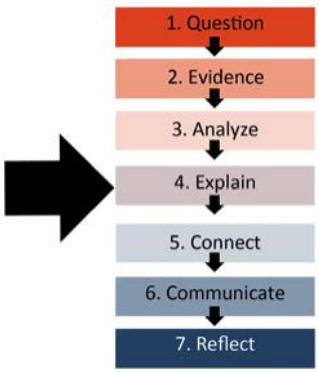
PHASE 4. EXPLAIN



The first presentation takes place. Focus on analysing and reflection in this phase is dialogue between the students and the teacher, and what the group gained of new knowledge through the process so far. Because dance is a nonverbal communication form it is an important phase of feedback to hear what the students have been thinking and why. Also the teacher can guide them even further in the movements/choreography connected to the scientific phenomena.

The teacher has the first "show and tell" in small groups.

1. Let the student make the first visual presentation-dance (with music).
2. The teacher gives feedback. Focus on how they could make it even more defined and connected to scientific knowledge. Go back back to the first phase of experiment, form, shape-process and give the students an even deeper meaning to all the chosen movements and their knowledge. In this phase we want reflection and analysing to be in focus.
3. Give positive feedback.

The students present for the teacher what the group has done so far.

1. The students present the visual presentation of the choreography (with music)
2. The students talk about the process and what the group has been focused on and working with.
3. The students share their questions, answers and research process.

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4. The students make their submission of the dance manual so the teacher can see the process during phase 2 and 3.
5. The students get feedback from the teacher on what they need to develop and work more with, to be even clearer in the movement and how it is connected to their scientific knowledge.
6. Ask questions to the teacher.

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PHASE 5. CONNECT

KEY CHARACTERISTICS

Practicing. Put all the pre-phases together, connect the scientific evidence questions and answers together with the creative dance presentation. This phase will be acting as a rehearsal phase. Take the feedback and make the last adjustments.

EDUCATORS' ACTIONS

This is the part where the teacher takes a step back and let the students lead the groups. To see if they got the feedback and let them have the opportunity to make their own decisions that suit the group. Keywords for the teacher in this phase is *support* and *repetition*. Make sure the students stay focused on repetition and don't add too many new movements and changes into their original choreography. Let the students build confidence in their presentation and practice it over and over again.

STUDENTS' ACTIONS

A. The students take the feedback of phase 4 and develop their material with small adjustments. Sometimes the students want to make more developments in this phase, this is also a sign of what more knowledge will do with us. But it is important that the students get back to basics.

B. If the students haven't gotten the chance yet to rehearse in the presentation area, it is important in this phase that they have an opportunity to do so. This is due to how the body remembers movement in a room.

C. Rehearse by repeating the choreography/dance presentation in the presentation area around 5 times (depending on the time and length). This rehearsal will build the students confidence and secure them to a presentation for the other student. "The more times you do it the more secure you will feel."

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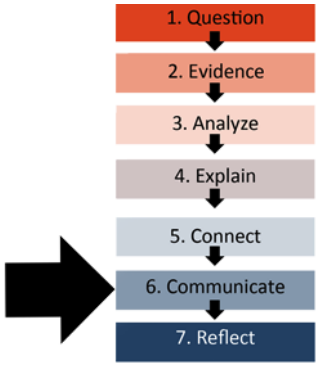
PHASE 6. COMMUNICATION



KEY CHARACTERISTICS

The big “Show and tell”. This is the presentation phase, where the groups present their scientific dance presentation to their co-students, or perhaps the rest of the school.

EDUCATORS’ ACTIONS

The teacher is the organizer, leading the presentations-round. If the students have different phases of scientific topics that are following a chronological order, it should be presented in this order to make a scientific point. For example if the teacher in Phase 1 showed the scientific experiment of the different phases of ICE-WATER-GAS and the students are divided in those groups then their presentations should be shown in that structure form.
ICE groups
Water groups
Gas groups

After each presentation the co- students can reflect over what they interpreted in the different dance presentations. And then the group can add information to what the co-students reflected on. This is led by the teacher.

STUDENTS’ ACTIONS

Presentation groups:
The students (the groups) share their scientific dance presentations with the whole class and then get to hear the co-students thoughts, reflections and analyzes. This is a responce to what they have been working on and had in focus.

Co-students:
Reflect and analyse what they see in the other groups scientific dance presentation.

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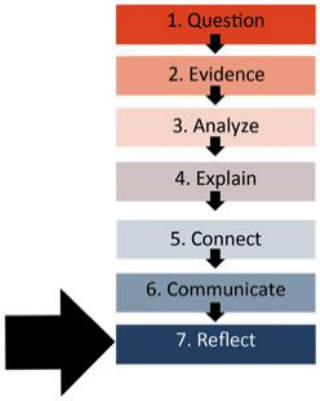

PHASE 7. REFLECT

KEY CHARACTERISTICS

A focus of individual elevation and the students reflection of the whole group process.

In this last phase we go back to the students individual knowledge, their analysis and reflection thoughts throughout the scientific dance process.

EDUCATORS' ACTIONS

In this last phase the teacher should make a reflection-form for the students to answer individually.

The form can give the teacher an opportunity to scan the new knowledge of each student and their development through the process in a written form.

This means that the reflection form can be made with the specific questions the teacher wants to ask and that can help map the value of the process.

In this last phase the student also can be given the opportunity to do the experiment again by themselves (if time). This is to end the process by doing the experiments with all their new knowledge added.

STUDENTS' ACTIONS

The students are now going to perform the scientific phase 1 experiment.

We go back to phase 1 with the teacher's scientific experiment and now it is time for the students to do the experiment themselves and write down what they experience with all the knowledge they been through during the science dance process.

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They write down their individuell reflections and analysis in a reflection form made by the teacher. This will be collected by the teacher in the end.

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