Teacher Lesson Plan Pack

A collection of 15 Teacher Lesson Plans using **Systems Thinking tools** to educate and act for a **sustainable future**

middle school grades  
4 systems thinking tools

5 thematic areas

COMPASS EDUCATION

www.compasseducation.org
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CE Mission

**Compass Education** (CE) is a non-profit organization and network of full time international teachers, school administrators, students and non-formal educators spread across the globe and active in 5 continents. CE strives to *empower* and *connect* learning communities to educate and act for a *sustainable future* and to accelerate the infusion of Sustainable Development and the concept of sustainability into the operations, management, teaching and learning and culture of international schools. We do this through advocating and applying *systems thinking* and experiential learning pedagogy with the social/organizational and technical/economic aspects of school practice.

CE Approach

The issues and challenges of sustainability cannot be reduced to mere pieces or problems that can be tackled as if they were unconnected to the rest of the world. Sustainability challenges are interconnected and the linkages are often invisible to our eyes and minds. Our young people need *new skills and values* to make informed decisions, and thus we need to find simple models and approaches to help us understand and address this complexity in more intuitive ways that both children and adults can easily grasp and relate to. It is for this reason that we utilize the **Sustainability Compass** (“Compass” for short), a concept ideated by Alan AtKisson, as our foundational framework and thinking model for inculcating a systems thinking ‘habit of mind’ in educating for a sustainable future.
Hereby is a list of the systems thinking tools that are used in the lesson plans of this package.

The Sustainability Compass is part of the Sustainability Accelerator Network tools that have grown out of its extensive experience working with companies, governments, schools, cities and many other types of organizations.

The other tools described here are used to help students use systems thinking and develop the habits of a systems thinker. The following describes some of the various systems thinking tools (which are not proprietary by the way) that Compass Education uses and promotes in our trainings, programmes, projects and activities. To find out more about the other systems thinking tools that are not used in the lesson plans of this pack you can visit our website at www.compasseducation.org
The Sustainability Compass is a tool that brings people together around a common understanding of sustainability, and a shared vision for getting there. A regular compass helps us map the territory and find our direction. The Sustainability Compass does the same thing for sustainability. It takes the English language directions — North, East, South, West — and renames them, while keeping the same well-known first letters:

- **N** is for **Nature**: all of our natural ecological systems and environmental concerns, from ecosystem health and nature conservation, to resource use and waste.
- **E** is for **Economy**: the human systems that convert nature’s resources into food, shelter, technologies, industries, services, money and jobs.
- **S** is for **Society**: the institutions, organizations, cultures, norms, and social conditions that make up our collective life as human beings.
- **W** is for **Wellbeing**: our individual health, happiness, and quality of life.

Educators can use the Compass to build in a sustainability lens to any topic, issue, lesson, activity or project. Students can use the Compass for note taking, forming questions, analysis and synthesis, and assessment.

The Compass is a highly versatile but simple tool that provides a common language to teachers and students to always be thinking about sustainability, what we call having a “sustainability habit of mind”.
Systems Mapping is a methodology particularly effective when used as a following up step of the Sustainability Compass. While the Compass allows to look at one topic from all its perspectives identifying different elements, Systems Mapping helps seeing the **interconnections** between them finding cause-effect relationships.

Causal Linkages and Causal Loop Diagrams are some tools that can be used to map systems:

- **Causal Chains** are ways to visualize the path of influence running from a root cause to the symptoms of the problem. Each link in the chain represents something in the real world. At one end of the chain is located the root cause of the issue and at the other end are the symptoms it causes. The many links that can be identified between the two ends represent the intermediate causes.

- **Causal Loop Diagrams** are ways to visualize relationships of important variables in a system where a change in one variable causes either a decrease or increase in another. By looking at all the interactions of the variables, the behavior of the entire system can be discovered. These diagrams consist of arrows connecting variables in a way that shows how they affect each other. A causal loop diagram drawing can show the relationships among one or more feedback loops relevant to a story being analyzed. The influence of the feedback will always create either a reinforcing or balancing dynamic in the system. Learning to build the causal loop diagrams can help students identify and understand the interdependencies in the whole system that they are interested in managing or changing through some intervention.
The iceberg model is a systems thinking tool designed to help individuals or groups discover the patterns of behavior, supporting structures, and mental models that underlie a particular event. One of the primary reasons we train teachers and students to use the iceberg is that it is a fantastic tool for guiding us to ask the right questions to any issue, problem and situation that we are addressing. The iceberg structure guides us in our analysis of events and helps understanding where and how to make change, or more directly, to identify and act on the system’s “leverage points”.

![Iceberg Diagram](https://example.com/iceberg.png)
A Behavior Over Time graph (BOT graph) is a curved line showing the trend or pattern of change of a variable over time. A BOT graph is a simple tool that can help students focusing on patterns of change over time, rather than on isolated events, leading to rich discussions on how and why something is changing. This tool can be used to graph the behavior of different variables or issues over time in order to gain insights into any interrelationships between them. They can include past, current and future behavior in a story.

Behavior Over Time graphs are usually used in combination with other systems thinking tools such as the Systems Iceberg and Causal Loop Diagrams.
About this Teacher Pack

The lesson plans collected in this Teacher Lesson Plan Pack have been developed and implemented by educators of different international schools after completing the Compass Education Level 1 workshop as part of their certification process.

All the lesson plans in this collection make use of the Sustainability Compass and other systems thinking tools in the domain of 5 different thematic areas (STEM, SEED, Geography, Humanities and Life Skills).

Each lesson plan includes:

- Educators’ information (name, school, country, submission date).
- Contextualization of the lesson (subject, number of participants, length, grade, systems thinking tools).
- Description of the purpose for using the tools.
- List of materials needed to implement the activities.
- Description of the sequential steps to implement the lesson plan.
- Plusses and challenges experienced by the contributing educators and their tips for future replications.
- Tips and suggestions for other practitioners and educators.

Some of the lesson plans are integrated with extra resources (presentations, research results, reports, assessment forms, etc.), these documents are available on an online folder that can be accessed by clicking on the grey icon located on the upper banner of the first page of the relative lesson plan.
SUSTAINABLE DEVELOPMENT GOALS
Project Based Learning for Local and Global Change

subject
STEM project

participants
360 students

length
2.5 months

systems tools
Sustainability Compass

Purpose for using the tools and achieving the learning objectives

In this STEM project the Sustainability Compass is used to research a selected Sustainable Development Goal in the Colombian context. By using the tool students increase their awareness on how the Goal is being worked on and on how related problems manifest themselves in their local setting. The tool also contributes to more accurate and well rounded discussions and presentations rather than proliferating stereotypes and one-sided or linear thinking.
Resources and Material

- Computers and internet access
- Parents and Administration's permission for off campus work

Lesson Plan Steps

1. Teachers organize a "Gallery Walk" on the 17 SDGs to test students' prior knowledge and questions on the topic.

2. Students reflect on what they already know and what they want to know on the topic and present on the SDGs in small groups with answers on their formulated questions and facts pertaining to Colombia.

3. Students group themselves into teams according to the SDG they want to work on and define a problem in their local context related to the Goal.

4. Students collaborate using the Sustainability Compass to do some research on the problem they defined.

5. Students meet with a mentor (fellow teacher trained to use prompting questions focusing on interrelationships and complexity) to discuss their research with the Sustainability Compass.

6. Students revise their Sustainability Compass model based on the mentor's feedback and look for additional visual data on www.ourworldindata.org

7. Students use divergent and convergent thinking tools to generate ways of solving the problem, coding the criteria, constraints and conditions related to their solutions and finally use a decision matrix to rank them.

8. Students begin either an Engineering Design or Design Thinking Process to make an iteration of their solution.

9. Students work with their mentors to test and get feedback on the iteration of their solution and make improvements.

10. Students improve their solution and present it at the SySTEM fair.
Reflection

Plusses

- The Sustainability Compass helped collaboration and increased shared knowledge.

- Framing community problems under an SDG showed that local changes can have global impacts.

- Working with mentors and organizations, elaborating campaigns and sharing results with the community gave the project a high degree of authenticity.

Challenges

- I would plan the project over more time to allow the iteration process to continue for longer and to have a bigger impact on the community.

- I would connect students with mentors outside the school community to have long lasting and sustainable projects.

- I would embed more systems tools into the process.

Tips

Link systems tools to Project Based Learning units for even more authentic and sustained inquiries.

Have an inventory of parents, staff and local stakeholders that are experts (or just willing to work with students) on the SDGs.

Create norms on how students and mentors should interact.

"The Compass fights misconceptions, linear thinking, or relying on opinions and stereotypes"
CHANGING SYSTEMS
Identifying and Assessing Sustainable Choices

subject
Individuals & Societies
Science Interdisciplinary unit

participants
24 students

systems tools
Sustainability Compass
Systems Mapping

length
2 weeks

Purpose for using the tools and achieving the learning objectives

In this lesson plan the Systems Mapping tool is used by students to investigate where the leverage points of the river/city system are. This instrument helps them to see where the greatest amount of change could occur in their system. The Sustainability Compass is used to assess the sustainability of a chosen solution to a certain problem.

"We discovered that the majority of the negative issues in our systems could be erased"
Resources and Material

- Water testing kits: pH, turbidity, temperature
- Notepads to record observed inputs and outputs proposed sources
- Cameras to record footage of inputs and sources
- Resources about common water pollution
- Post it notes or large white boards to create Systems Maps

Lesson Plan Steps

1. Students go on a field trip to the river in their city and walk along the canal. They observe issues related to the river's health taking water quality tests and checking inputs and outputs to the river including garbage, sewerage, water run-off, fishing, etc. These become indicators of the health of the river.

2. Students choose one indicator to be used to investigate the river's health.

3. Students individually complete a systems map to understand how the indicator came to existence (for example the use of plastic bags or the presence of phosphates).

4. Once a leverage point is identified through the system's map, students propose a change (behavior or innovation).

5. Students analyse through the Sustainability Compass lens their proposed solution and try to justify the change determining how successful they think it will be.

6. The final product of the unit is a report about students’ investigation and proposed change.

7. During the final school week students have the opportunity to try to positively impact the health of the river.

Some of the ideas students came up with are: using cloth bags, refusing straws, adding more garbage cans, increasing garbage pick-up, canals clean up days, producing phosphate-free soaps, creating organic fertilisers, etc.
**Reflection**

**plusses**

- Students engagement was high because of the practical use of systems maps and the Sustainability Compass points.
- Students were able to actively see how leverage points work.
- Students were able to judge the sustainability of their solutions across all areas of society, nature, economy and wellbeing.

**challenges**

- Due to the topic, systems mapping could be challenging for some students individually. For this reason some of them working on the same indicator were grouped, but they were still able to choose their leverage point and to suggest different solutions to complete the task independently.

**Tips**

Either through class activities or individual research, students should investigate the impact of the presence of the indicators in the river system (i.e. origin and impact of increased phosphates in the river) in order to know how to complete the systems map. It can be helpful to work through one indicator of river health as a class, creating a systems map and then exploring a proposed solution through the Sustainability Compass points.
Purpose for using the tools and achieving the learning objectives

In this unit the Sustainability Compass is used as a supporting tool for research by the student who analyzes sustainability indicators in different countries. The aim of the unit is for the student to develop skills like investigating, collecting evidence, presenting, planning, reviewing, recording, interpreting data, using ICT and constructing bar charts, through activities while also increasing knowledge and understanding of a topic area.
Resources and Material

- Computer
- Internet access

Lesson Plan Steps

1. The teacher elicits student's knowledge on sustainability presenting the UN's Sustainable Development Goals and explaining how they are organized using the Sustainability Compass.

2. The student chooses a number of countries all around the world with different levels of development looking for reliable sources of statistics per country.

3. The student chooses the sustainability related indicators to be analyzed in the project ensuring that they cover all the four directions of the Sustainability Compass.

4. The student records the data collected using tables and charts.

5. The student develops a bar graph with the collected data and a PowerPoint presentation.

6. Teacher and student discuss the possible relationships between different indicators.

"The Sustainability Compass is a clear visual aid for representing complex problems"
Reflection

plusses

- Student’s previous knowledge on the SDGs and the Sustainability Compass facilitated her working on the project.

- The four dimensions of the Compass helped to dig into the concept of sustainability and to understand the interrelations between the different areas.

- The Sustainability Compass served as a guide to choose the indicators.

challenges

- The mathematical part of the project could be enriched by using other graphs to represent the collected data and by discussing the advantages and disadvantages of each of them for the specific case.

- The cross-curricular nature of the theme opens up the possibility to have the students applying Mathematics to Social Studies.

Tips

Giving students the possibility to choose the countries to analyze enhances their motivation, they can learn more about their own country and those they are more interested in.

Having more students involved in the project would enrich discussions and give the possibility to collect more data about other countries and indicators.

Additional statistics concepts (i.e. mean, mode, median, range) could be applied providing another source of discussion.
HUMAN DEVELOPMENT
Human Development is Complex: Factors and Leverage Points

<table>
<thead>
<tr>
<th>subject</th>
<th>participants</th>
<th>length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science</td>
<td>12 students</td>
<td>1 lesson</td>
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Purpose for using the tools and achieving the learning objectives

In this lesson plan, by using the Sustainability Compass students are able to look at the topic of hunger as a complex and interrelated issue. Consequently, students are stimulated to ask questions and discuss about the topic in thoughtful, reflective and insightful ways.

"During the workshop, when doing a similar activity, I was inspired by the depth of discussion that such a simple exercise provided"
Resources and Material

- Assorted colored marker-pens
- Hunger image
- Projector
- Paper

Lesson Plan Steps

During each stage of the lesson students are encouraged to participate in healthy discussions with their peers and to openly question the issues being raised.

2. The teacher shows students, divided in groups of 3/4, the picture of a stereotypical "Hungry Children".

3. Students are asked to write down any words or phrases they can think of when looking at the image. These words and phrases are recorded on separate pieces of paper.

4. The teacher introduces the Sustainability Compass as a tool that can be used to think of and discuss about issues in a broader "sustainability" sense.

5. Based on the introduction of the Sustainability Compass, the class discusses about how the concept of sustainability involves more than just environmental factors.

6. Students are asked to add more words and phrases on the Compass model with different colours keeping in mind that "hunger" can be looked at in terms of Nature, Economy, Society and Wellbeing.

7. Groups are asked to draw arrows on the poster to indicate how some words or phrases can be linked to multiple points of the Compass.
Reflection

**plusses**

- Using the Sustainability Compass is a brilliant way to introduce a new topic.

- Students had the chance to think broadly about hunger.

**challenges**

- Students need to be aware of what the four points of the Sustainability Compass stand for, but the teacher should not prompt answers.

**Tips**

Provide detailed instructions but limited advices and answers; students in groups talk openly amongst themselves.

The teacher should move quickly from group to group to give positive praise to good discussion points and, at times, providing leading/open questions.
LIVING ON MARS
How Decisions Impact Human Life

subject          participants          length
Life science      28 students         3 lessons

systems tools
Sustainability Compass

Purpose for using the tools and achieving the learning objectives

In this lesson plan the Sustainability Compass is used as a way to teach students what being sustainable really means and why it is important to look at all the possible ways one decision can impact the human race in both negative and positive ways.
Resources and Material

- Devices for research
- Large poster
- Markers

"Many light bulbs turned on students' heads allowing for great class discussion"

Lesson Plan Steps

1. Students are divided in groups and asked to discuss on a possible definition about what sustainability really means to them.

2. The teacher introduces the Sustainability Compass and the definitions of its related concepts.

3. Students in groups are asked to match each part of their definitions of sustainability with the related Compass points on a poster.

4. Students are faced with the question "Should we send people to inhabit Mars?" and told to list as many factors they can think of to answer the question and to locate them on the Sustainability Compass template where they believe they fit best.

5. Students walk around the classroom reading other groups' Compass templates and adding to them what they think is missing.

6. Students return to their Compass template and discuss in group about what they read and new nodes, adding new factors to their poster if deemed necessary.

7. Groups are asked to make a list of positive and negative nodes from their Compass. Based on the list, students make a decision as a group about the initial inquiry and present their reasonings to the class.
Reflection

plusses

• Students were highly engaged during the activities.

• Students were able to start thinking in a new way.

• At the end of the lesson students were ready to take the Sustainability Compass learning tool to the next level.

challenges

• I had to prompt students to think about the real reason why we should possibly not go to Mars.

• I would have students creating a questions column on the Compass template to collect and address inquiries.

Tips

Allow time for research and show informational videos and other resources before starting to use the Sustainability Compass. For example, after students watched a Ted Talk on the issue, their discussions became more stimulating and they could find more factors to be added to the Compass template.
**SOCIAL AND ENVIRONMENTAL ENTREPRENEURSHIP DEVELOPMENT**

**Introduction to the SDGs and Sustainability**

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<th>subject</th>
<th>participants</th>
<th>length</th>
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</thead>
<tbody>
<tr>
<td>SEED class</td>
<td>20 students</td>
<td>1 lesson</td>
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**systems tools**

- Sustainability Compass

**Purpose for using the tools and achieving the learning objectives**

This lesson focuses on defining and discussing sustainability in general. Following on from individual and then group definitions of sustainability, the Sustainability Compass is used to map the 17 SDGs. The purpose of the unit is to focus on students' understanding of the links between all issues and the various points of the Sustainability Compass.
Resources and Material

- A3 sized Sustainability Compass model per group
- 17 SDGs cards set per group

Lesson Plan Steps

1. The first session includes sustainability defining exercises for the class to re-familiarise with the Sustainability Compass and to introduce the tool to the new students.

2. After the introduction session students in small groups are given A3 sized Compass models and the 17 SDGs cut into cards.

3. Groups are asked to match the SDG cards on the four Compass quadrants.

4. When all the groups are done, students rotate around the classroom to look at the similarities and differences of each poster.

"Trying to link each SDG to the Compass points provides students with great discussions"
Reflection

plusses

• This is an "Easy to set up" exercise that gets students working in collaboration.

• Students are stimulated to discuss about the meaning of each SDG and about the Compass points they most closely link with.

challenges

• If students divide the cards between themselves and match them individually the discussion becomes limited. The teacher should encourage students to go through each SDG as a group.

• Some groups have little debate while others require a lot of talking through.

Tips

It is helpful to have some preliminary work on the SDGs done before the activity for students not to only have the "titles" of the SDGs to base their decisions on. In a previous lesson I divided the class into smaller groups and assigned them some SDGs to focus on, then put together some slides and finally presented it to the class.
In this lesson plan, systems thinking tools are used in the reflection sessions following the Fishing Harvest simulation game*. By using the tools students are able to deepen their understanding of sustainability, to understand and apply the concepts of Tragedy of the Common and Carrying Capacity, to interpret Behaviour Over Time Graphs, and to apply the Sustainability Compass to a given or experienced scenario.

*see annex 2 for game’s instructions (page 56)
Resources and Material

- Materials for the Fishing Harvest simulation game
- Tally chart
- Paper
- Pens

"Students loved the activity and really good discussion and learning happened"

Lesson Plan Steps

1. The first part of this lesson consists in the Fishing Harvest simulation game (full game instructions on page 55). While playing the game, students divided in group assume specific roles and act accordingly upon the simulated reality of the fish harvesting sector over the time span of 12 years. Prior starting the game the teacher introduces the terminology of Carrying Capacity.

2. After playing the game the class is asked to plot a Behavior Over Time Graph about the trends of fish capacity they encountered during the game. Students are then asked to discuss about the following questions:
   - What happened?
   - When did things go wrong?
   - When and how should they have intervened?
   - Where is the leverage point?
   - What can be done on such leverage point?
   - How to avoid the situation?

3. During this 3rd step, students apply what learned while playing the game and discussing to the Systems Iceberg model. They look at each level of the Iceberg to identify leverage points. When addressing the mental models at the bottom of the Iceberg, the class discusses the changes that each actor they simulated during the game could have made to create a sustainable scenario.
The class compares the findings and thoughts gathered during the Behavior Over Time Graph and the Systems Iceberg activities, checking whether they reached the same or different solutions.

Students in group apply the Sustainability Compass to the game. Each group then locates the factors and influences of the fishing community they were assigned to on the Compass. When finished, students walk around and look at the other groups' Compass posters. Finally the class in a plenary session discusses about all the points of the Sustainability Compass considering the perspectives of each group and reflecting on how society is impacted by them.

Reflection

plusses
- The lesson brings together different systems thinking tools.
- Students felt part of the problem.
- Students experienced how easy it is for different parties not to work together.

challenges
- The game could take longer than expected.
- During the Systems Iceberg activity students struggled to come up with possible moral, social or beliefs changes.

Tips
Plan it carefully, there are many passages in the process and you might want to use certain tools before others.
HUMAN DEVELOPMENT

Human Development is Complex: Factors and Leverage Points

subject  
Geography

participants  
17 students

length  
2 sessions
40 min each

systems tools  
Sustainability Compass

Purpose for using the tools and achieving the learning objectives

The aim of this lesson plan is to help students understanding human development and inequality as part of a complex system influenced by many factors. The Sustainability Compass is used with the Sustainable Development Goals to find connections and leverage points, while in the second session, the Triangles Game serves to illustrate the complexity of the system and the relevance of leverage points.
Resources and Material

- Numbered stickers
- SDGs printouts
- Chart paper
- Markers

"The game illustrated students the complexity of the system and the relevance of leverage points"

Lesson Plan Steps

Session 1

1 Students divided in groups of 4 are asked to develop a Sustainability Compass model using Human Development as a topic.

2 The class has a discussion to define and gain a common understanding of the concepts of Nature, Economy, Society and Wellbeing.

3 Students are asked to make connections between the quadrants of the Compass and to indentify and discuss possible leverage points.

4 Students are arranged in a circle and each one is given a SDG printout. The teacher stimulates a discussion on how the SDGs relate to the 4 quadrants of the Compass and on how they connect to each other to identify more leverage points.

Session 2

1 After being arranged in a circle students play the Triangles Game*.

2 While playing the Triangles Game the teacher moves one student within the system, resulting in some of the connections having to move in order to keep their linkages. The teacher stimulates a reflection on the activity relating it to leverage points.

3 To conclude the lesson, teacher and students draw the connections revealed during the game on a circle chart highlighting the leverage points.

*see annex 1 for game’s instructions (page 54)
Reflection

plusses

• Students enjoy doing stimulating activities, especially if outdoor.

• Students understood the connection between the different areas of impact of the system by deconstructing Human Development as a concept due to the fact that they were representing the system.

challenges

• I would not use all the activities in the same lesson again because it didn't leave enough time for discussions.

Tips

If the Triangles Game is perceived as challenging by the students I would suggest to have a first demonstration with only one reference per student and then gradually move to two references forming equilateral triangles.

I would suggest to record the Triangles Game for students to watch it later in order for them to be able to visualize the system and its interconnections.
GLOBALIZATION & SUSTAINABILITY
The Influence of Tourism on Destination Countries

Purpose for using the tools and achieving the learning objectives

In this lesson plan, the Sustainability Compass is used to help students reflecting on how travellers influence the countries they visit. Using the tool students are able to analyze the impacts of tourism in Bali and to later extend the study to other connected examples.

“This activity helped me seeing how much the students learned and how much their thinking developed"
Resources and Material

- YouTube video: "Tourism leaves Bali's poor facing drought"
- Instructions and Questions sheets
- Sustainability Compass model
- Colored pencils

Lesson Plan Steps

Before starting the activities the teacher introduces the Sustainability Compass, its concepts and the tasks of the unit.

**Session 1**

1. Students fill in the Sustainability Compass according to the prompt "The effects of tourism" using a colored pencil.
2. Students watch the video "Tourism leaves Bali's poor facing drought".
3. Students fill in the Sustainability Compass again after having watched the video, this time with a different pencil color.

**Session 2**

Students are asked to answer the following questions:

- What is the purpose of the video?
- What do you think about the effects of tourism in Bali?
- Write about personal experiences that connect to this video

By reading the individual answers to the questions, the teacher is able to assess students' level of understanding of information and their ability to draw conclusions identifying ideas, opinions and attitudes that are based on both spoken/visual text and personal experiences.
Reflection

plusses

• The Sustainability Compass helped students to frame their thinking, responses and reflections giving them the vocabulary about Nature, Economy, Wellbeing and Society.

challenges

• I would introduce the Sustainability Compass earlier and go through an example together as a class before having students applying it during an assessment activity.

Al Jazeera English. "Tourism leaves Bali's poor facing drought - 27 Oct 08"
WATER POLLUTION
Understanding Differing Values and their Impact on the Environment

subject: Geography
participants: 21 students
length: 1 lesson

systems tools
- Sustainability Compass
- Systems Iceberg
- Systems Mapping

Purpose for using the tools and achieving the learning objectives

This lesson plan focuses on the issue of water pollution and it is part of a 18 lessons unit that covers the importance of water resources and tropical rainforests, the negative impacts humans have on them and possible solutions for their sustainable management.

While the Sustainability Compass is used to facilitate students organizing their thoughts, Systems Mapping is used to help them identifying and understanding the interconnections between the different effects of water pollution. The Iceberg model is introduced to the class to guide the discussion at the end of the lesson and to move on to the next activity on sustainable water management.
Resources and Material

- Printed photos
- Whiteboards
- Large recycled paper

Lesson Plan Steps

1. During the first part of the lesson students watch a video about microbeads and discuss their impact. Students are also introduced to the unit’s objectives and key questions.

2. As a class, students practice photo analysis by using the Sustainability Compass to organise their descriptions and explanations.

3. In pairs, students analyze 12 photos to be used during the Systems Mapping activity. Groups of 4 then create systems maps on the white board or on recycled paper. All of the connections must be annotated and color coded according to the Compass points. Students can add their own drawings if they think anything is missing.

4. In a plenary session students discuss the photos with most connections (described as leverage points for the issue) using the Systems Iceberg to steer the reflection on why humans pollute.

"Systems Thinking tools allowed students to synthesise their thinking and explain the complexity of the issue"
Reflection

plusses

• Using the Compass to organize the analysis of the photos helped students to develop a deeper understanding of causes and effects.

• The activities helped students to improve their writing by elaborating on their explanations further and examining other issues provided more carefully.

challenges

• Students wanted to add too many arrows in their Systems Map, not only the direct causes and effects connections.

• It is challenging to explain to students that they need to move step by step without missing out connections.

Tips

Systems Mapping can be used with photos but also simple words and ideas. Starting with just a few different parts of the Systems Map and then gradually adding more helps students feeling confident with the process.
INTRODUCING SUSTAINABILITY
Representing Social Issues in a Dramatic Form

subject: Drama
participants: 22 students
length: 90 minutes

systems tools
Sustainability Compass

Purpose for using the tools and achieving the learning objectives

The purpose for using the Sustainability Compass in this lesson plan is to introduce students to the concept of sustainability and to help them reflecting upon complex social issues.
Resources and Material

- Post-it notes
- Note cards
- Poster
- Markers
- Projector
- Images

"It doesn't matter what you teach, you can always tie the idea of Sustainability to your lessons"

Lesson Plan Steps

1. Students are asked to write on a post-it note their name and what they think sustainability is.

2. Students are divided in groups and each member of the group writes on a poster what sustainability is according to him/her using the quadrants of the Sustainability Compass.

3. Each group comes up with its own definition of sustainability and reads it out to the class.

4. Images (to be previously selected by the teacher) representing various social issues are projected on the board. Students in groups have to write down on the Sustainability Compass poster, words or phrases that come to their mind when looking at the pictures.

5. Students in groups discuss about the complex issues they see in the images and others that might not be showed. They have to choose a complex issue that everyone in the group is interested in.

6. Introduction of the next phase: during the next session students will create a performance representing the complex issue they have chosen by adapting it to a fairytale or a children's story.
Reflection

plusses

• Some students didn't know the concept of sustainability. It’s always nice to introduce a topic from which students can learn something new.

• Listening to students' discussions I could learn more about sustainability myself.

challenges

• It is important to think of strategies to engage students who might tend not to participate in the activities.

• Including a definition of sustainability in the presentation could help students to think about the concept.

Tips

Always know why you are doing something. I had students asking me what sustainability had to do with drama, and I knew exactly what to respond.

In order to have balanced groups whose components work well together it is good to choose their composition beforehand.

It is important to always have the material ready, especially the visual tools for students to easily follow the instructions.
Purpose for using the tools and achieving the learning objectives

In this unit the Sustainability Compass is used to critically evaluate potential sustainable solutions to global and local issues revisiting and developing students' knowledge and understanding of sustainability. Systems Mapping is used to introduce the ideas of systems and to develop the understanding of the interrelated nature of our planet, seeing the world and its problems in systems and allowing solutions to become more effective.
Resources and Material

- Newspapers, books, brochures
- Arts and crafts materials
- Internet access

Lesson Plan Steps

1. Each student creates a visual collage to capture how humans are dependent upon natural resources using pictures from magazines, newspapers, brochures or the internet. On the back of the collage students write a 300 words response to explain the image answering to the following questions:
   - Are humans dependent upon the natural environment of the Earth?
   - Do you think humans value the natural environment and its resources?
   - Do all humans have the same attitudes and beliefs towards nature?
   - How do you treat and value your natural environment?

2. Students identify human systems and compare them to natural Earth systems looking at their linear and circular attributes.

3. Students explore what makes an effective and sustainable solution before moving on to look at some real examples.

4. The four dimensions of the Sustainability Compass are introduced and unpacked, and definitions are agreed upon. Students then apply the tool to assess one solution proposed as being sustainable.

5. Students investigate their College and Community's beliefs and goals in terms of sustainability. They are taken on a Campus tour to discover attitudes and technologies to strive for a sustainable system.

6. Students reflect on their learning from the tour and each creates a personal pledge to further assist the College goals. They choose one solution they are intrigued by and carry out a Compass analysis and evaluation to discover how sustainable it is.

"Linking the unit with your own College sustainability goals helps installing values, commitment and care"
Reflection

plusses

• Students were able to think critically.

• Students enjoyed the visual aspects of the Sustainability Compass and Systems Mapping.

challenges

• It is important to look for organic and meaningful opportunities to use the Compass in other units of work.

• It would be interesting to explore and use other systems thinking tools.

Tips

Sharing ideas with others is really helpful. It can be inspiring to look at how other teachers use the Sustainability Compass in lessons that are not explicitly linked to the environment.
Purpose for using the tools and achieving the learning objectives

In this lesson plan the Sustainability Compass is used to encourage students to look at communities from different angles and to assess how sustainable they are. The tool is also used to analyse the role of the SDGs and systems thinking in tackling global issues. As the last step of the lesson, the Systems Iceberg tool stimulates a discussion on the origins and development of problems.
Resources and Material

- T-chart
- Markers
- Posters
- Strings
- Post-it notes
- Whiteboard
- Movie "The Giver"
- SDGs icons and definitions

Lesson Plan Steps

Session 1

1. The class watches the movie "The Giver" as an introduction to the concept of "Perfect community".

2. Students create a T-chart on the characteristics of perfect and imperfect communities marking the elements that coincide with our modern world.

3. The teacher introduces the concept of systems thinking using communities as an example.

4. The class analyses the community portrayed in the movie from different angles through the Sustainability Compass and collects the results on a poster.

5. The class discusses about the differences between the community presented in the movie and their own thinking of possible solutions.

Session 2

1. The SDGs and the concept of sustainability are introduced and students are asked to match the SDGs icons with their definitions.

2. Students analyze how the SDGs relate to the Compass and spread the icons on the poster discussing how systems thinking guides the development of goals and solutions to global issues.

3. Students in circle try to find connections between the SDGs using strings to physically connect them.
Session 3

1. The teacher introduces the Systems Iceberg tool to the class.

2. Students are distributed slips of papers with notes, they sort them across the Iceberg model in order to distinguish events, patterns, behavior and systems structures.

3. To complete the Iceberg model students have to come up with mental models that relate to the other categories.

4. To conclude the lesson the class discusses on ways to draw assumptions and the beliefs underlying systems' structures.

"The Sustainability Compass broadened students' minds on where to look when searching for issues causes and implications"
Reflection

**plusses**

- Students engaged in deep reflections despite their lack of vocabulary and language fluency.
- Students familiarized with the tools and were able to discuss, explain and refer to the components of the Compass and the levels of the Iceberg.

**challenges**

- EAL students need to be coached and guided along the way. Thinking abstractly in a foreign language can be a challenge.
- I would add more elements of research into the project.

**Tips**

Devote some activities to the meaning of tools' components and their exemplification in order to avoid misunderstanding.

When students work on the Iceberg, it is necessary to guide them along the different stages and ask them to synthesize the information as much as possible.

Use attractive and appealing sources like movies and real-life examples in order to guarantee motivation and meaningful experiences.
Purpose for using the tools and achieving the learning objectives

In this lesson plan the Sustainability Compass provides students with opportunities to understand what a system is and how to create and identify connections between many aspects related to systems. Using the tool in group, students identify what they need to achieve together and they organize and carry out the tasks using different learning skills such as research and communication.
Resources and Material

- Theme-related books and magazines
- Arts and crafts materials
- Computer

Lesson Plan Steps

1. Students research about environmental issues and choose a particular topic related to the theme.
2. Students do more specific research to learn about the topic of their interest.
3. Students and teacher brainstorm together ideas related to the topic using the Sustainability Compass.
4. Students collect pictures and photos on books, magazines and the internet.
5. Students summarize the information they have got on the topic.
6. Students pull together the results of their research and write a newsletter on the environmental issues they’ve chosen.

"Using the Sustainability Compass students were able to make connections between nature and their own life"
Reflection

plusses

• The Sustainability Compass helped initiating both individual and collective thinking in response to new information.

• Working in group, students could exchange ideas, questions and comments.

• Students developed skills in different areas of learning as well as habits in terms of sustainability.

challenges

• Students were confronted with tasks they had never done before like using basic ICT skills.

• The activity required more time than initially expected.

Tips

Brainstorm ideas and choose the most appropriate sustainability and systems thinking tool.

Compile evidence of students' progress to scaffold learning.
Purpose for using the tools and achieving the learning objectives

Nature, Economy, Society and Wellbeing are important concepts but their abstract nature makes it hard for some students to grasp their meaning. The aim of this lesson plan is to give students a basic understanding of these concepts using the Sustainability Compass to generate questions and to help them identifying everyday objects or activities and their relations with Nature, Economy, Society and Wellbeing.
Resources and Material

- Pictures of everyday objects and activities
- Sustainability Compass template
- Sustainability Compass terms
- Projector
- Glue

Lesson Plan Steps

1. The lesson starts with the teacher introducing the Sustainability Compass to the class through some focus and recall questions on what the students already know about the tool.

2. Students watch the YouTube video "Introduction to the Sustainability Compass" and discuss on the Compass points and their meaning.

3. Students are grouped in pairs and provided with a large Compass template.

4. The teacher demonstrates an example on how to identify a picture of an everyday activity (i.e. students eating lunch) and sticks it into the relative quadrant on the Compass template.

5. Pairs are given a set of pictures of everyday activities and objects; they lay the pictures out to make them all visible.

6. The teacher instructs the pairs about working together to sort the pictures in the four Compass quadrants.

7. The class discusses the results in order to reach the same understanding and agreement.
Reflection

plusses

• Using videos and pictures helps students to better understand the concepts of Nature, Society, Wellbeing and Economy.

• Students managed to complete all the steps of the lesson plan.

challenges

• Younger students need more time to have a better understanding of the four Compass points before matching them to the Compass template.

Tips

Planning your lesson with visual materials is really helpful especially with students with special needs.
Annex 1: Triangles Game

In this game, a group of participants (representing different elements in system) try to maintain their own interdependent relationships with other individuals over time to create a steady state sustainable system in equilibrium. Through their own movements and interactions, group members experience several important concepts related to causality and systems thinking, including interdependence, feedback, balancing processes, time delays, high and low leverage, and the idea that structure generates behavior.

Part 1

- Participants gather in the game area and make a circle and the facilitators informs them that the goal for everyone will be to make an equilateral triangle with two other people in the group.

- Each person chooses two other people who will be his/her two linkages indicators during the game. They will have a causal relationship with these two people: when one or the other moves, they must move to keep an equilateral triangle form.

- When the game starts players have to slowly move around the room until they are equally distant from their two references. They should stop moving when equidistant from their references.

- When players are steady and equidistant from their references, the facilitator asks questions on how the process went.
Part 2

The second stage of the activity illustrates the concept of leverage and shows the extent to which a change in one part of the system can have impacts in a very different part.

- The facilitator chooses two people from the group and randomly relocates them in the game area.
- Participants are asked to move again, based on the new disposition of the people that were relocated, in order to re-establish their own equilateral triangle with their original two reference points.

At the end of the activity the facilitator leads a debriefing session with regards to low and high leverage points, meaning those places that cause nearly everything to change (high leverage points) and those that only affect some elements in the system but not everything (low leverage points).
The Harvest Fishing Game is a simulation activity where participants, playing the role of different actors in the fishing industry sector, explore the concept of the *tragedy of the commons* and experience systems dynamics that unfold over time. Playing the game participants are provided with the opportunity to practice communication and decision making in a complex system.

The game requires 2-6 teams each comprised of 2-6 individuals, and it has a duration of 15-30 minutes.

**Scenario of the game**

In the initial scenario to be introduced at the beginning of the game, the fishing industry accounts for a large part of GDP and employees a substantial number of people in each of the cities and communities surrounding the Great Lake, which supplies 60% of the country's protein intake.

Each table team represents a different Fishing Group from the communities surrounding the Great Lake:

- Group 1: Local Community Fishing Cooperative formed by several villages from the same district.
- Group 2: Independent Fisherman from one local community.
- Group 3: Multi-national Fishing Company (HQ in Asia).
- Group 4: Multi-national Fishing Company (HQ Capital city).
- Group 5: Illegal migrant fishers from neighboring countries.

All the four groups' fishing fleets share the same fishing ground, the Great Lake, which has a **carrying capacity** of a maximum of 50 fish resource units at any one time. Each fish unit is equal to 100,000 metric tonnes of fish and is worth 250,000 US Dollars.

The game will start with the lake having somewhere between 25-50 fish resource units. Participants will not know the exact number of fish resource units when the game starts.

**Rules of the game**

- During the game 10 fishing seasons will be simulated with each team deciding on a fishing harvest target per year. Before each new fishing season, there will be 2 minutes time for teams to discuss and decide how many fish they will seek to harvest in the given year towards the group's goals.

- Participants will indicate their Team's targeted harvest for the season (number of fish units), according to the nature of their company or group, by writing it on a slip of paper on their "fishing boat" and taking the boat up to front to Mother Nature (the facilitator of the game).

- Mother Nature will fill the orders randomly each fishing season. The caught fish will be returned into the ships of the groups. If the season target of one group exceeds the number of fish in the lake at that particular time, it will receive no fish for the given year and the group can contribute to fish the next season.

- One person in each team will need to be the team's "bookkeeper": when the group receives back the fishing boat from Mother Nature, the bookkeeper removes and counts the fish recording in a table the number of fish set as the year target and the total monetary value for the catch actually received.
Debriefing session

Tipically one or two teams will pursue an aggressive strategy and place large orders during every season in the game causing the fish population to decline and lowering the possible harvest for everyone. Sometimes there will be a serious effort to coordinate all the teams' decisions to have a total harvest that can be sustained over the 10 seasons, but the effort usually fails either because ignored by one or two teams or because based on a false estimate of the maximum carrying capacity of the lake.

At the end of the game, after each team has reported its wealth on a flip chart visible to everyone, the facilitator can lead the participants through a discussion about their experience:

- What happened during the game?
- Who was responsible for the result?
- What would have been the maximum possible wealth available to all the teams in the activity?
- What wealth did teams actually achieve?
- Was there a winner in the game?
- What policies would you have to follow to achieve maximum wealth for all the teams? Why might these policies not be followed?
- Where do you see examples in real life of the behavior witnessed in the game?
- What policies could be followed in real life to produce a more sustainable result?
CE Programs

CE provides certified training for students, teachers and administrators on using the Sustainability Compass and systems thinking for integrative, big picture issue analysis, innovative problem solving and sustainable action. **Systems thinking** is the core skill necessary for students to successfully function within our increasingly complex world, and this concept is at the core of Compass Education’s tools.

- **Our School Leadership Training** is designed to equip school leaders and learning communities with tools, methodologies and strategies to fulfil the school’s mission and vision, and to accelerate the change towards a sustainable learning community.

- **Our Educator Empowerment Training** is intended for teachers, sustainability or environmental coordinators, service learning coordinators, curriculum coordinators and those in similar roles. Educators are provided with the Sustainability Compass and Accelerator tools, methods and strategies that enable them to effectively integrate sustainability into any lesson or activity and allows students to see the world as the interconnected whole that it is.

- **Our Student Empowerment Training** is designed for middle and high school students to be able to effectively use and train others, including their peers and their teachers, on Compass, sustainability and systems thinking.
Subscribe to our newsletter and check out our website to stay up to date with what is new at CE and the upcoming events.

Contact us and/or submit your lesson plan or story of interest at

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