EUCLIDES

Enhancing the Use of Cooperative Learning to Increase Development of Science studies

Guidelines for the Experimentation
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1. Introduction: a brief description of PBL

What is PBL? PBL is not a new educational model. Both Plato and Socrates required that their students think, collect information directly, search for new ideas and debate them in a scholarly environment.

Where does PBL come from? PBL was officially adopted as a pedagogical approach in 1968 at the McMaster University, a Canadian medical school, since students were unable to apply their basic scientific knowledge to clinical situations.

How does it Work? Students in small groups investigate and analyze problems/scenarios by: 1) identifying the FACTS in the problem/scenario; 2) generating their IDEAS about the scenario/problem and identifying what the problem is; 3) finally identifying what they have to LEARN - in order to test their hypotheses (ideas).

Why is PBL an effective scientific approach? The use of this three step inquiry-organizer helps students to become familiar with the reasoning process of a scientist, helps also to fill the gaps in their own knowledge, and to use their newly acquired knowledge to refine or discard their ideas thus generating a whole new set of LEARNING NEEDS.

1.1 Benefits in the use of PBL

The PBL method is:
- student centred (understanding the needs of the student learner)
- integrative (skills and content)
- problem-based (e.g. it works with real world/real time problems)
- self-directed (e.g. pursue own learning enquiry and often manage complex timetabling)
- collaborative
- reflective
- creative... encourages making connections and thinking ‘outside the box’
1.2 Skills developed through PBL

The acquisition and structuring of knowledge in PBL works through the following cognitive effects:

- Intellectual Generic-critical reasoning, creative thinking, problem-working
- Intellectual Subject knowledge and understanding- e.g. interdisciplinarity
- Practical/Applied Generic- formulating hypotheses, designing investigative strategies, information gathering, information handling, evaluating information
- Communication (oral/written/graphic)
- Interpersonal teamwork
- Self and career management: time management, group management
2. PBL in EUCLIDES: organisational steps and online environment

The methodology is structured as follows:

- SETTING
- SCENARIO
- RESEARCH PATH
- PRODUCT DEVELOPMENT
- PRESENTATION OF FINAL PRODUCT
- GROUP EVALUATION AND SELF-EVALUATION

The guidelines describe the meaning of each step and their applicability in the activities in the learning environment.
PBL is based on a Moodle platform, engineered and personalised on the Euclides project and PBL specifications. Moodle is a Course Management System (CMS), also known as Learning Management System (LMS) or Virtual Learning Environment (VLE). It is available on the Web and teachers can use it to create online learning environments.

Access:
Through the web page http://www-era-edu.com/euclides or from the project’s website http://www.edu-projects.eu/euclides, and by clicking on “E-Learning Section”, the platform for the experimentation opens (see picture below).
Enter username and password and click on “login” to visualise all the courses.
The system automatically recognises the user when username and password are entered.
3. The structure of the Learning Environment

The platform is structured by country and class. In each class teachers and students will find:

- Forum News
- 1. Setting
- 2. Scenario
- 3. Research Path
- 4. Evaluation
- 5. Presentation

Forum News

This is a forum where themes and messages can be entered also for asynchronous communication.

This activity could give a significant contribution to successful communication and to the building of a community in an online environment.
4. PBL in Euclides step by step

4.1 Development of the learning environment

The first step consists of setting the rules to regulate the work group. This is a very important phase since the success of the whole process depends on clear rules for the group. Students, under the teacher’s supervision, establish ground rules defining some fundamental points: the roles of teacher and students, the group organisation (criteria), the system of rules as well as the definition of ethic rules for the group, the establishment of the typology of product presentation (communication of results), the assessment tools and the sharing of criteria and tools for documentation.

Rules include, but are not limited to: respect for everyone’s ideas (no idea is "stupid"); not interrupting others while they are speaking; “what should be OK in this process and what should not be OK” (the rules of the game). The most important task in this phase is to establish a non-judgmental climate in which students recognize and list what they know and what they do not know.

The result expected in this phase is a document showing agreed decisions in order to create a climate of cooperation.

So, practically, the main activities in this phase are the following
- Definition of the role of teacher and student
- Group composition (definition of criteria)
- Setting and sharing the group’s operational rules (definition of roles, e.g. secretary, group leader, person in charge of the technical aspects, person in charge of documentation gathering etc.)
- The group’s ethic rules
- How the products are presented (communication results)
- Work timetable
- Evaluation methods (e.g. credits ...)
- Sharing communication criteria and tools

The following are some of the key words for the achievement of good results in the first step:
- Work together
- Reciprocal respect
- Respect for roles
- Be responsible of one’s own work
- Information sharing
- Be good listeners
- Praise your colleagues
- Constructive criticism
4.2 The SETTING in the platform

Groups
Each group leader enters the names of those belonging to his/her group by first clicking on the group name and then on “Update”.

Working Protocol
this section defines the topic and the way to tackle it.
Click on Working Protocol and then on “Update” (only teachers allowed)
4.3 The SCENARIO - present a situation encouraging the development of scenarios existing in the curricula and definition of the problem

In the second phase the teacher creates a PBL Scenario containing a problem to be presented to the group. The Scenario could be inspired by literature, television programmes, news programmes or newspaper articles. Here learners experience an information-rich situation that will make them understand important physical and social contexts relevant to the task. Scenarios should be introduced to students without giving them any prior information. They should gather the information needed or learn new concepts, principles, or skills to solve the problems presented in the Scenarios. A good and effective Scenario is close to reality, in line with the student contexts and with the learning results and assessment; it should also be appropriate to the level of study, to the level of complexity/openness and challenging.

The scenario could be a cartoon, a video, a newspaper article, a photographic document, audio file, a TV programme which may arouse the interest of the class (e.g. the EUCLIDES platform).

The teacher, acting as a facilitator, introduces the selected Scenario to the students and starts a free discussion in the group. In approaching the Scenario the students should:

- set a series of questions related to the reward system
- choose the topic to work on according to the questions
list what is known. (Student groups list what they know about the scenario. This information is listed under the heading: "What do we know?" This may include data from the situation as well as information based on prior knowledge. Clarifying terms used in the problem and their meaning is a good way to assess students’ prior knowledge, before moving on to a more in depth examination. Students have a pre-existing knowledge and life experiences, therefore have a base to start from; this step students gain conscience of their experiences and begin to use them. Teachers need to ensure that all students participate in the discussion, they should also help the group consider critically the information brought in by its members.

- define the problem and develop a problem statement (a problem statement should come from the students’ analysis of what they know. The problem statement will probably have to be updated as the new information collected has an impact on the situation. Typical problem statements may be based on discrepant events, incongruities, anomalies, or on client’s requirements.)

- analyse the problem (the students read through the problem and discuss it. They may be tempted to “diagnose” the problem right away and need to be encouraged to think more deeply about all the “why’s, how’s and when’s”)

- outline what is not yet known and what is needed in order to formulate hypothetical solutions to the problem (when presented with a problem, students will need to find information to fill in the missing gaps. A second list is prepared under the heading: "What do we need to know?" These questions will lead to online research in the library and in other out-of-class researches.)

- set hypotheses and objectives of the research, define possible actions, suggestions, solutions. On the basis of the previous debate students generate hypotheses about the nature of the problem, including its possible mechanisms. It is important that teachers help them from falling into the trap of jumping to diagnosis and superficial assessment of the clinical aspects of the problem. The aim is to have the students focus on understanding the key concepts which are illustrated in each problem, and this requires that they delve deeper into it. The teacher will ensure that all students are involved in this step, and that the hypotheses generated can be related to the learning objectives of the problem.
Creating PBL Scenarios

Ideas for PBL scenarios can come from almost anywhere; literature, television programmes, news programmes or newspaper articles.

By use of graphics, animation, audio or video, the learner can experience an information-rich representation that can alert the learner to important physical and social contexts that are relevant to the task (Hoffman & Ritchie). This leads to greater cognitive fidelity between the real world and the learning task.

The scenario must:
- be real (students should perceive it as their own reality)
- appropriate to the class context
- motivating and enticing

*Introduce an "ill-structured" problem/scenario to students.*

Students should not have enough prior knowledge to solve the problem. This simply means they will have to gather the necessary information or learn new concepts, principles, or skills as they engage in the problem-solving process.

They learn to investigate the same way as scientists. Problem based learning is the best way for students to learn how to conduct real life science investigations. They apply many strategies such as: asking questions, designing experiments, and developing hypotheses.

When using the scientific method in combination with problem based learning, students develop a better understanding of experimental investigations. The best types of investigation for this strategy are science mysteries. Students use critical thinking skills as they design and conduct an investigation to solve a mystery.

Practically, the main activities in the scenario carried out by each group are the following:
- free discussion on a series of questions to create a debate
- students will choose a problem to work on
- problem definition
- problem analysis
- knowledge (what I already know) is reviewed and organised on the basis of the aspects already analysed
- determine what is yet to be known to formulate hypotheses for the solution of the problem
- formulate hypotheses and objectives for the research work
4.4 The SCENARIO in the platform

Scenaria Exempla
Two examples of scenario (“Crisis of the Biodiversity” and “Climate changes”) have been presented as videos uploaded on Youtube. Click on Scenaria Exempla, then on PLAY.

My Scenario
The class will enter its own scenario with a Word processor and links. These operations (only teachers and group leaders allowed) can be finalised by clicking on “My Scenario” and then on “Upload”.
4.5 RESEARCH PATH

The third step is the creation of the research path consisting of:
- guided observation
- resources outlining (e.g. bibliography and sitography)
- data and information analysis
- group re-elaboration of data and information
- first hand hypothesis formulation

The effectiveness of this step is mainly connected to the students’ level of knowledge about the problem proposed. In fact, they should not have enough prior knowledge to solve the problem. This simply means they will have to gather the necessary information or learn new concepts, principles, or skills as they engage in the problem-solving process.

Adopting the Problem Based Learning methodology, students will learn to investigate the same way as scientists, conducting real life science investigations. During the research path, they will apply many strategies such as: asking questions, designing experiments, and developing hypotheses. Using the scientific method in combination with problem based learning, students will develop a better understanding of experimental investigations.

The best types of investigations for this strategy are science mysteries. Students will use critical thinking skills as they design and conduct an investigation to solve a mystery.

In this step each group will inform the others (in a meeting) about the work done and assess it with the teachers in order to produce the first draft of the final presentation.

The main activities in this phase are the following:

**List what is known.** Student groups list what they know about the scenario. This information is kept under the heading: "What do we know?" This may include data from the situation as well as information based on prior knowledge.

**Develop a problem statement.** A problem statement should stem from the students' analysis of what they know. The problem statement will probably have to be updated as new information is discovered and has an impact on the situation. Typical problem statements may be based on discrepant events, incongruities, anomalies, or on user's requirements.

**List what is needed.** Presented with a problem, students will need to find information to fill in the missing gaps. A second list is prepared under the
heading: "What do we need to know?" These questions will lead to online search in the library and in other out-of-class researches.

**List possible actions, suggestions, solutions, or hypotheses.** Under the heading: "What should we do?" students list actions to be taken (e.g. questioning an expert), and formulate and test tentative hypotheses.

Practically, the research path will require the following actions:
- guided observation
- resources outlining (e.g. bibliography and sitography)
- data and information analysis
- group re-elaboration of data and information
- first hand hypothesis formulation

**to answer the following questions:**

<table>
<thead>
<tr>
<th>What do we know?</th>
<th>What do we need to know?</th>
<th>What should we do?</th>
</tr>
</thead>
</table>
4.6 The RESEARCH PATH in the platform

Identifying the problem
The teacher will describe the problem to be solved and the outcome of the debate in the class on the state of the problem. To modify this resource on the page click on “Modify” – top right – then on “Update”.

What do we Know?

Our knowledge
This is a glossary for the addition and consultation of terms considered important for the work.
Select the relevant icon and add term by clicking on ”Add Term”.

This activity allows participants to draw up a list of definitions, like a kind of dictionary that can be prepared by the students during their research work. Students will meet with unfamiliar terms, therefore this type of glossary may be useful to build up the spirit of cooperation in a group since each member can be assigned the task of finding a term, of contributing to the search for a definition or commenting.
Multiple definitions can be classified by the teacher and the students, and those considered more useful will be included in the final glossary.

The purpose is to make students feel responsible for creating the definitions and also feel more involved in the process which in turn will help them to remember the terms and their correct definition.

**What do we need to Know?**

**What should we do?**
This is a Forum in which it is possible to debate and share topics.

**Action Plan**
This resource can be modified only by the teacher who will enter the “action plan” to reach the objective.

**Glossary**
Its purpose is to draw up a list of definitions linked to the topic. Students will be actors by giving a meaning to new terms regarding the topic. They will also have the opportunity to draw up their own glossary when meeting with unfamiliar terms. Each class member may contribute to one definition.

Click on the relevant icon and add term by clicking on the Add term button.

**My Research Path**
The tool “My Research Path” allows teachers, group leaders and students to upload Word files, images and videos.

**Wiki**
A wikipage allows teachers, group leaders and students to add contents related to terms regarding the work carried out. It is a webpage in which each class can carry out joint building operations with the browser with no knowledge of HTML processes. A wikipage opens with a fist page and each contributor can add further pages by creating a link with a page that does not yet exist. This is a quick method to create a group content. Usually no one is in control of the final content but the whole community writes, creates and develops it. The class can therefore create its own product or alternatively each student can produce his/her own wikipage and work together with teachers and colleagues.

It is possible to modify other users’ texts, adding or deleting part of them. Proceed with care when deleting the texts in this section to avoid cancelling previous entries.
Resources

These are the most important tools provided by the platform. Each tool refers to a link to a web page dedicated to the project containing a series of very versatile tools which the student will find useful for the search of materials (e.g. photos, files, audio interviews, videos ...), to upload what they already have or what they have found.

Wikipedia

This is a free, multilingual encyclopaedia created by web users. Its like a traditional encyclopaedia and a state of the art dictionary. Its purpose is to create and distribute an encyclopaedia that is free and rich in content.

Slideroll

This is a photo slideshow maker to create slide shows with photos. Music and effects can be added.

YouTube

This is a video sharing website where the students can upload, view and share video clips related to the theme of the conceptual map.

Google

Search engine to find data and documents on the Web.
4.7 EVALUATION

The fourth step consists in assessing the solution to the initial problem. Each group will assess the validity of the work carried out. It is important that each student as well as the group have the opportunity to reflect on the process of learning that has taken place. This includes reviewing the knowledge acquired, and is a chance for group members to share the feedback on contributions to learning and an evaluation of the group’s work. Furthermore, summarizing new learning helps consolidating it for future application.

Specific questionnaires will be prepared and the fields of evaluation will be:
- Performance evaluation
- Teachers satisfaction
- Students satisfaction
- General evaluation

Suggested indicators:
- Group work spirit
- Respect timetable and roles in the group
- Knowledge of scientific language
- Ability to establish links between concepts
- Ability to build a theory from observation
- Ability to find and analyse a problem
- Truthseeking
- Openmindedness
- Inquisitiveness
- Systematicity
- Cognitive skills
- Maturity
- Power of analysis

Some examples of evaluation questionnaires (the teachers could use other evaluation tools and other evaluation questionnaires)
QUESTIONNAIRE A - 1ST SELF EVALUATION (before implementation)

1. Please write a short definition of the following terms:
   - science:
   - environment:
   - global:
   - climate:
   - drought:
   - flood:
   - life cycle:
   - natural resources:
   - abiotic factors:
   - biotic factors:

2. Please combine the concepts of column A with the concepts of column B.

<table>
<thead>
<tr>
<th>COLUMN A</th>
<th>COLUMN B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Emission of gasses</td>
<td>A. Catastrophic floods</td>
</tr>
<tr>
<td>2. Deforestation</td>
<td>B. Climatic change</td>
</tr>
<tr>
<td>3. Diversion of rivers</td>
<td>C. Renewable energy</td>
</tr>
<tr>
<td>4. Increase of insect pests</td>
<td>D. Greenhouse effect</td>
</tr>
<tr>
<td>5. Sun and wind</td>
<td>E. Depletion of oxygen</td>
</tr>
</tbody>
</table>

3. Please build a short theory explaining each of the following observations
   I. Many dead fish are floating in the small lake near your village. Why?
   II. Mosquitoes are still flying around although it is winter. Why?
   III. Last summer there was a big fire at the forest at the mountain above your village and this winter there are many catastrophic floods in the village. Do you think these two events are related? If yes, how are they related?

4. Please describe the steps you would follow in order to analyse the following problems (find the causes and suggest solutions).
   I. The oil has become very expensive during the last 5 years.
   II. The wells (or the water springs) of the village have been dried for the last 5 years.
QUESTIONNAIRE B - SELF-ASSESSMENT ON THE SOLUTION TO THE INITIAL PROBLEM (In the middle of the implementation procedure)

1. Names of the members of the group
2. What was the topic of your research?
3. What were the main questions and problems related to the topic?
4. What was not known and you wanted to find out?
5. What was your initial hypothesis?
6. What were the objectives of your research?
7. What were the results of your research?
8. Do you think your initial questions have been answered?
   Yes ☐ No ☐ Indifferent ☐
   If no, what do you think are the reasons for this?
9. Did you have sufficient access to literature, computer and internet?
   yes ☐ no ☐
1. Name

2. Did you find the project interesting?
   yes ☐  no ☐  indifferent ☐

3. Did you find the implementation of the project easy to follow?
   yes ☐  no ☐  indifferent ☐

4. Did you enjoy working in a group?
   yes ☐  no ☐  indifferent ☐

5. What was your role in the group?
   head ☐
   secretary ☐
   data collector ☐
   data analyser ☐
   technician ☐
   communicator ☐
   other ☐

6. Did you respect your role within the group?
   yes ☐  no ☐  indifferent ☐

7. Did you respect the time within the group?
   yes ☐  no ☐  indifferent ☐

8. Please, write a brief description of your responsibilities in the group

9. Did you participate in the final presentation?
   yes ☐  no ☐
   If yes, did you enjoy your participation in the final presentation?
   yes ☐  no ☐  indifferent ☐

Now that you have implemented the EUCLIDES project, it is a good opportunity to find out what was your progress on the scientific way of thinking. By filling again the following statements, you will have a good self assessment. Enjoy.

10. Please write a short definition of the following terms:
    science:
environment:
global:
climate:
drought:
flood:
life cycle:
natural resources:
abiotic factors:
biotic factors:

11. Please combine the concepts of column A with the concepts of column B.

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12. Please built a short theory explaining each of the following observations
I. Many dead fish are floating in the small lake near your village. Why?
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III. Last summer there was a big fire at the forest at the mountain above your village and this winter there are many catastrophic floods in the village. Do you think these two events are related? If yes, how are they related?

13. Please describe the steps you would follow in order to analyse the following problems (find the causes and suggest solutions).
I. The oil has become very expensive during the last 5 years.
II. The wells (or the water springs) of the village have been dried for the last 5 years.
4.8 EVALUATION in the platform

Area for uploading and answering questionnaires to evaluate the work carried out.

4.9 Creation and PRESENTATION of the final product

The final product will consist in finding a solution to the initial problem proposed in the Scenario. The solution will be presented with a timetable determined by the type of product (video, power point, documents...)

4.10. PRESENTATION in the platform

This area will show the final product. Video files, power point documents, word or pdf documents max 2MB.
5. The EUROPEAN SHARING ROOM

Throughout the whole learning process, students will use this page to exchange their experiences and acquired knowledge with their foreign colleagues involved in the project also by a presentation of their home town, of the class and the topic treated. This should be written in English.

There are three forum rooms in this page:

**News forum**
This section will be used by the administrator to enter the news on the project and the report on the work in progress.

**Present your hometown and your class**
This section will be used to describe one’s own town and class also with photos and videos ...

**Describe the problem you are solving**
In this section it will be possible to share ideas and problems with the other students on the issue treated.
The following operations may be carried out within a Forum:

1. **enter a new topic**: click on the relevant button on the main page. Each user of the e-learning platform can carry out this operation.

2. **enter a room**: click on the name of the room to enter the message archive:
3. **add text messages with images, videos or hypertextual links:** click on “Answer” to enter the message page and add text:
6. The role of the teacher as facilitator

Summarising the previous section, the teacher’s role could be described as follows:

1. As a first step the teacher facilitates the definition and the sharing of rules within the group: the roles of teacher and students, the group organisation (criteria), the ethical issues etc. (step 1). It is useful to underline that rule setting is very important for the success of the overall process.
2. Subsequently the teacher creates and introduces PBL scenarios (incentive situation to propose the problem to solve) to the students.
3. Then the teacher supports and coordinates the realization of research a path consisting of:
   → guided observation
   → resources outlining data
   → information analysis
   → group re-elaboration of data and information
   → first hand hypothesis formulation
4. At the end of the process the teacher will assist the group in assessing the validity of the work carried out, using specially provided indicators and supports the group in the creation and presentation of the final product.

In synthesis the teacher’s job as facilitator of the PBL process consists in:
climate setting (create a safe environment for self-directed learning); planning (organization and structure of tutorials); clarifying learning needs (frame learning objectives and set goals); designing a learning plan (help students with learning plans, develop strategies, use expertise to outline challenging questions); engaging in learning activities (guidance to ensure that students are on track with their learning, focus on understanding key concepts); evaluating learning outcomes.

The tools and strategies to achieve the facilitator’s goals are:
- Challenge students to apply new concepts in different contexts and recognize previously learned concepts when they appear again
- Questioning (what have you learnt in the past about that...? I.e. building on prior experience)
- Remaining silent at times
- Guiding (have you thought of...?)
- Challenging (how does that work...?)
- Playing Devil’s Advocate (an alternative scenario might be...?)
- Stimulate discussion (do you know from other work of any examples? what might the pitfalls be? have you thought about time/ cost/ social/ political /ethical factors etc.)
- Monitor group process and respond effectively to undermining behaviours (I thought that you agreed that...?)

An effective facilitator is student centred. The facilitator creates right from the start a motivating environment and manages group dynamics, using questions effectively, ensuring constructive feedback and managing time and process. A good PBL facilitator always avoids to interrupt students or over-participate, and doesn’t allow the group go off the track, doesn’t promote competition rather than cooperation and avoids to push students too hard or not enough.

The usual steps that any group goes through in a PBL process and that the teachers have to facilitate are the following:

**Forming**
When groups are first formed, members are usually uncertain about their roles and the functioning of the group. The facilitator’s job includes helping to build trust and acceptance amongst the group and ensuring that the need for orientation is met.

**Storming**
This stage is notable for the beginning of competition and conflict between group members. This is a normal and healthy development arising from individuals being required to adjust to the needs of the group. The teacher must recognize these conflicts, normalize them and help to ensure that they are used to further the functioning of the group. Encouraging the members of the group to actively listen to each other: ensuring that everyone is being treated fairly and with understanding is crucial.

**Norming**
Having passed through the second step, groups characteristically move on to develop cohesion and a sense of identification with one another. At this point, an active exchange of ideas and feelings between members occurs. The teacher is not required to be as active in facilitating group process and students are able to function more independently in achieving their learning tasks. However, it is important for the facilitator to continue to track group function and offer feedback when necessary.

**Performing**
Not all groups are able to reach the stage in which the group is more than the sum of its parts. This becomes possible if the members work well together, with a high level of trust and allowance of independent activity.
7. Common difficulties in PBL Groups and right approach to tutorial process problems

In the tutorial process the teacher could face some difficulties due to specific characteristic of the group members:

_The quiet group member_
While people all have their own personality style, the group member who is very quiet and is felt not to be actively contributing to the group’s learning may be identified as a problem in PBL process. It is important to understand why the group member is quiet - is he/she feeling intimidated by other group members? Is he/she unprepared for tutorials? Is it a preference for holding back until everyone has contributed? Is he/she not being given air time by other group members?

Teachers can assist the quiet member by drawing on areas of expertise or asking for an opinion. Once the issue is identified an open discussion within the group may rectify the problem. However, on occasion, lack of contribution to tutorial may be a sign of personal turmoil or difficulties. A quiet word outside of the tutorial might be helpful allowing the tutor to point the student towards some of the supports that are provided by the educational program. The quiet student may also feel uncomfortable talking about concerns about other group members and may need some guidance from the tutor. It is very important that the tutor not collude (or appear to collude) with the student. It is key that the tutor facilitate the group as a whole to deal with the issue whenever possible.

_The dominating group member_
Conversely, some individuals have a tendency to talk a great deal in tutorial-to the extent of disrupting group functioning. Again, understanding what lies behind the behaviour is important in dealing with it. The tutor may ask to go around the group in order to hear from everyone or may attempt to draw out the other group members. Some advise avoiding eye contact with the dominating member. Should the behaviour persist, it will come up in the end of tutorial evaluations and then it will be dealt with.

_The group that keeps storming_
Interpersonal conflicts are an inevitable occurrence when people are working together. Early on, this is a normal part of the group formation process and is a necessary step as people give up some autonomy in order to facilitate group work. When conflicts within the group persist or begin to interfere with the group’s function, it is important that these be dealt with. Again, the end-of tutorial evaluation is a natural place for this discussion to begin. The tutor has an important role in surfacing the issues and ensuring that the perspectives of
all group members are heard. Facilitating the group’s decision-making around handling the issues is also important, ensuring that there are no personal attacks and no ganging up on one another.

In general, a good facilitator:

- Does not collude with a student or a group of students (avoiding the development of schisms within the group)
- Listens carefully to everyone
- Listens some more
- Clarifies issues with the group
- Seeks underlying causes
- Facilitates group solutions
- Guarantees observance of the rules shared within the group
- Induces to disagree in a constructive way during the discussion
- Facilitates cooperation within the group
- Stimulates thorough examination of the problem, not diagnosis