Flipped Classroom Lesson Plan

“ABOUT MECHATRONICS”

School: ”Alexandru Domşa” Technical High School, Alba Iulia

Teacher: Bianca Elena Hoisan

Lesson Title: About Mechatronics

Subject Area(s): Technician in mechatronics

Grade Level: 11th grade

Time Needed: Home: 30-40 minutes(or more), Class: 50 minutes

UNITS OF KEY COMPETENCY/KEY SKILLS

| THE USE OF COMPUTERS IN PROCESSING INFORMATION | 1. Use information from the Internet.
|                                                  | 2. Organize and process information.
|                                                  | 3. Use technology IT multimedia (web communication) to create Web documents.
|                                                  | 4. Use software applications for the automated management of projects.
| COMMUNICATION                                   | 1. Deliver presentations on professional topics.
|                                                  | 2. Moderate debates and meetings.
|                                                  | 3. Produce documents on professional topics.

Learning Objectives

- to define the mechatronics;
- to describe the functioning of the mechatronic system;
- to identify the components of the mechatronic system;
- to recognize and use the mechatronic systems in everyday life.

Brief Description of Activity:

Students will use a teacher created Wiki/Blog/Site to study mechatronics. After reading and studying the materials and watching the videos at home, the students coming to class and will create a mind map(each group) together.
Student’s Learning Resources at Home

- Computer
- Internet access
- Link to the teacher created Wiki 
  http://mecatronicsintempo.wikispaces.com/About+Mechatronics
- Videos on youtube chanel. Ex. https://www.youtube.com/watch?v=Ro_tFv1iH6g
  https://www.youtube.com/watch?v=7h2PIDXIo4Y
- Link to the teacher created classroom on the platform https://ctad.moodle.ro/ or other platforms able to provide this feature (Google Classroom, Edmodo, ..)
- Materials or CD (for student without internet access at home)
- Paper and a writing utensil
- Teacher self-created
- Flipped Classroom Student Learning Checklist

Student Learning Activities at Home

- Study materials posted on the site following the instructions posted by the teacher
- Collaborate with teachers through the forum of the platform, English teacher included (a large amount of information and resources available on the internet are in English language)
- Collaborate with their peers through the forum on the platform as well as creating groups on social networks or communication (Facebook, Skype, Google Drive)
- Prepare questions for the teachers
- Suggest other learning resources
- Take notes

Learning Resources in Class

- Chart paper
- Assorted markers
- Teacher provided study guide (about the mind mapping)
- Computer
- Internet
- Wiki link
- Software for mind mapping: https://mindnode.com/,
  https://www.novamind.com/download/, Inspiration Software®’s Inspiration® 9
Classroom Activities

The organizational form of class: The class is divided in 5 groups of 5 students.

Models of Instruction: The Cooperative Learning Model is used for creating in students intrinsic motivation, positive interaction, and an attitude of helping each other learn.

The following cooperative methods are used in this lesson:

- **Visual Brainstorming** techniques to help them generate ideas, record what they know about a topic, identify questions for further inquiry, support the research and writing process. Each group work together to build and develop a **Mind map** about the topic (mechatronics). Similar to other types of graphic organizers, mind maps are visual displays of information, but they are only used when there is just one main idea. Other types of diagrams can include multiple main ideas.

Ex.

- **Gallery Walk (work in group):**
  Students add their Mind map on the chart paper, and post them on the wall. Students peer-review each other's' Mind maps as they walk around the review and write their comments on the papers.

Rolle of the teacher: Teacher checks that students have done the preparation for class by looking over their work. If they have not done these, or they are done incorrectly, then they will be sent to a computer station to do that part of the homework before they join the rest of the class.
teacher encourages them to work quickly, since the delayed start to their group work means they may have to finish the group work on their own at home. The teacher will circulate in the room and provide help and give feedback.

**Assessment or Summative Evaluation:**

- Evaluation will be done for each group according to the quantity and quality of the information conveyed and the thorough accuracy of their mind map. Group evaluation will consider the evaluation sheet projected by the teacher on the screen.
- Also, there will be an individual evaluation based on a quiz or a test.

**Feedback**

All the students are given feedback worksheets, where they assess their own activity, the teacher’s activity and that of their classmate; last but not least, they will have the chance to express the level of satisfaction for the lesson that has just finished.

**Resources**

1. [Flipped Classroom Student Learning Checklist](#)
2. [Flipped Classroom Lesson Plan Rubric](#)
3. [Group Evaluation Rubric](#)
4. [Flipping the Classroom strategy](#)
5. [Mind Maps for Brainstorming](#)
6. [Mind Mapping Tools](#)
7. [The “Gallery Walk” method](#)
# Flipped Classroom Student Learning Checklist

<table>
<thead>
<tr>
<th>Flipped Classroom Student Learning Checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What have you learned?</strong></td>
</tr>
<tr>
<td>List the contents learned</td>
</tr>
<tr>
<td><strong>Where and how did you learn it?</strong></td>
</tr>
<tr>
<td><em>Where:</em> Indicate the URL or the software</td>
</tr>
<tr>
<td><em>How:</em> Such as watching, listening, playing, chatting with friends, online group, social network, with parents or siblings, etc.</td>
</tr>
<tr>
<td><strong>What questions do you still have?</strong></td>
</tr>
<tr>
<td>Bullet questions for the teacher in the classroom</td>
</tr>
<tr>
<td><strong>Other</strong></td>
</tr>
<tr>
<td>Record any suggestion or issues</td>
</tr>
</tbody>
</table>
# Flipped Classroom Lesson Plan Rubric

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Sub-categories</th>
<th>Developing</th>
<th>Proficient</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lesson Info</strong></td>
<td>Author</td>
<td>0.5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lesson title</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Subject Area</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Grade Level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time Needed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Key competency /Key skills</strong></td>
<td>One –three entries</td>
<td>0.5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Learning Objectives</strong></td>
<td>One –three entries</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><strong>Learning Resources at Home</strong></td>
<td>Video/Audio/Materials/</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Internet resources</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flipped Classroom Student Learning Checklist</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Teacher self-developed resources (not required)</td>
<td>Optional</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Learning Activities at Home</strong></td>
<td>Students filling in Flipped Classroom Student Learning Checklist form: -What is learned, -Where it was learned, and -What questions they still have</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other, such as exercises and learning resources contribution</td>
<td>Optional</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Classroom Instruction Activities</strong></td>
<td>Instructional materials preparation</td>
<td>0.5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Student home learning assessment</td>
<td>0.5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Instruction for common problems</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Individualized or small group differentiation strategies</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><strong>Assessment</strong></td>
<td>Formative/Summative assessment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Challenging questions for higher performers</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Differentiated assessment strategies</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total Score (20)**
# Group Evaluation Rubric

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Points Assigned</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation for class</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Using Wiki/website resources and videos</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>• Filling in Flipped Classroom Student Learning Checklist form</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Every member of the group must play a role in the creating Mind map</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Cover the main contents</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Organize content and procedure logically in the Mind map</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Work collaboratively</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Make presentation/Mind map appealing to audience</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>After Gallery Walk the students review and write their comments on the papers for completion the Mind map</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Total Score</strong></td>
<td><strong>10</strong></td>
<td></td>
</tr>
</tbody>
</table>
Flipping the Classroom strategy

What is a flipped classroom?

The flipped classroom model utilizes Internet technology to facilitate the learning process in your classroom. This model provides teachers with more time to interact with their students helping them process chapter content, and less in class time lecturing content. Most are doing this with videos that students watch before coming to class, but there are other options available as well. The most powerful part of this model is the increase time for processing new content. What was class work (the "lecture") is done at home by way of teacher-created videos and what was homework (assigned problems) is now done in class (Bergman & Smith, 2012).

The basic design of a flipped classroom draws on strategies like active learning, student engagement, hybrid course design, and podcasting. The value of a flipped class is the reorganization of instruction, providing students an opportunity to individually watch lecture content, test their understandings, and apply their knowledge. Probably the most valuable part of this model is that it provides students with time to interact with one another through hands-on activities during face to face class meetings. Teachers function as coaches who plan for students to engage in individual investigations and collaborative effort while processing content.

Here are the basic components of a flipped classroom:

- A blending of direct instruction (where the teacher supplies the knowledge base) with constructivist learning (where the students are ultimately responsible to construct their own knowledge). An increased interaction between students and teachers.
- An environment where students take responsibility for their own learning.
- A classroom where the teacher is not the center of attention, but instead, serves as a guide or facilitator of learning.
- A blending of direct instruction (where the teacher supplies the knowledge base) with constructivist learning (where the students are ultimately responsible to construct their own knowledge).
- A classroom where students who are absent due to illness or extra-curricular activities such as athletics or field-trips, don't get left behind.
- A class where the curriculum and lessons are always available for review or remediation.
- A class where all students are engaged in their learning.
- A place where all students can get a personalized education.

How does it work?

A flipped classroom takes on many forms. The basic model might include students viewing multiple video lectures (five to seven minutes each) with the possibility of online quizzes or
activities interspersed to help students test what they learned. Immediate quiz feedback and the ability to rerun lecture segments helps clarify points of confusion. The following day, teachers lead in-class discussions or facilitate classroom student-centered activities where students can create, collaborate, and put into practice what they learned from the lectures they viewed outside the class while clarifying and extending their understanding of the content. The teacher's challenge is to find appropriate activities, projects and/or assignments that require higher order thinking skills (see Blooms Taxonomy).

These assignments or activities should be done with others so that students can begin to negotiate meaning from others and then transfer this new meaning to new situations or tasks. Because this approach represents a comprehensive change in the class dynamic, some teachers may choose to flip only a few selected lessons during the school year.

**Watch this Video.**

**What does it look like?**

The flipped model requires the teacher to offload lecture content for online viewing and then he or she must create learning experiences for students that help them to process and extend the new content knowledge. What flipping the classroom does well is cause a unique shift in priorities. Now, instead of merely covering material, teachers and students are actually working toward mastery of it (Bergman & Smith, 2012).

**Who is doing What?**

In a flipped classroom, the teacher will:

- create or collect online content resources for students.
- design small group activities designed to facilitate the processing of content.
- provide one-on-one tutoring to students who have trouble with the new content.
- facilitate differentiated learning opportunities for students to demonstrate their higher-level learning (encouraging analysis and synthesis of the new content as it also relates to previous content knowledge).

In a flipped classroom, the students will:

- input content online in a variety of format options while taking notes.
- practice the concept at home and in the classroom though guided support online.
- learn to be more accountable and independent with tasks and assignments.
- collaborate with peers as they develop content expertise.
What are the advantages?

There are many advantages to using the flipped classroom. Some of the advantages are:

- increased dialogue and shared ideas between students, teachers, and experts.
- access to video and other online content can be seen in any location.
- emphasis on higher level thinking resulting in more challenging curriculum.
- individualized control over the lesson pace.
- varied instructional grouping making it easier for students to learn from one another, problem solve together, and complement each other according to their skill level.

What are the disadvantages?

Some teachers feel that this model is much more difficult to replicate. Often, the disadvantages include:

- limited knowledge and resources for what to do during class to help students process the content.
- increased effort and time on the part of the teacher for lecture recording.
- differentiated planning for the integration of in-class and out-of-class elements
- added consideration of technology or compatible equipment to access the video lessons from the teacher.

While there are both strengths and weaknesses to this model, it is important to focus on the benefits that this model provides students. These results seem undeniable; the flipped classroom shows great promise.

Sources:


4. https://www.youtube.com/watch?v=BfsLbGgUMDU

5. https://tch4902012mb7393.wikispaces.com/Flipped+Classroom+Lesson+Plan
Mind Maps for Brainstorming

Why Brainstorm?

Brainstorming is a great way of solving problems and coming up with new ideas. It allows you to examine the problems from outside the boundaries of normal thinking, and understand the issues and root causes, and come up with alternative solutions. Brainstorming can also be used for impact analysis and decision making.

In the project management context, you can brainstorm from the objectives and goals down to the tasks to explore new ideas, possibilities and alternatives. It gives us a much more understandable and complete plan than what you would get if you just stuck to task level planning.

Brainstorming can be great for team building where you have shared discussions, and also for individual ideation, and has the benefits of improving initiative and innovation within an organization or individually, as well as improving quality and profitability, efficiency and morale.

Basic Concepts of Brainstorming
The basic concept behind brainstorming is to capture ideas as quickly as possible so that you get past the judgment that you typically use to assess ideas before recording them, and instead we want to capture the ideas as they occur assuming no money, time, resource or any other constraint, and without judgment, building on ideas as you think of them as well as pushing yourself to think in new directions. The concept is that out of quantity comes quality – there will be great ideas in amongst the many ideas you throw out there.

As you think of the ideas, you record the keywords on topics – at the moment, you don’t care where you put the topics, because you can graft them elsewhere later, but if it isn’t slowing you down, you might like to do some high level grouping by putting some of the main topics in place and adding related ideas as sub-topics. In some cases, it can work well to have a few floating topics for your main ideas, and create “islands” of information which you can organize and refine later.

In order to keep up with the recording of ideas, you can just type in the topic, press Return/Enter to finish, and press Return/Enter again to create the next topic, and so on. This makes it really quick to record the information as it comes up.
Another idea is to look at similar problems in different domains and seeing if you can apply solutions that worked in that domain to the idea you are brainstorming about.

You can also ask the question “How would others solve/approach this?” This is particularly useful when you take the point of view of other parties involved in the problem or impacted by the solution.

You can ask questions like:

- Who?
- What?
- Why?
- When?
- Where?
- How?
- How often?
- Who does this impact?

…to encourage yourself to look at the problem from a different perspective.

Mind Mapping Tools

Mind mapping is a revolutionary approach to both teaching and learning. Using mind maps as an innovative thinking tool in education helps students to visualise and externalise concepts and understand the connections between different ideas.

A mind map is a graphical way to represent ideas and concepts. It is a visual thinking tool that helps structuring information, helping you to better analyse, comprehend, synthesize, recall and generate new ideas.

Just as in every great idea, its power lies in its simplicity.

In a mind map, as opposed to traditional note taking or a linear text, information is structured in a way that resembles much more closely how your brain actually works. Since it is an activity that is both analytical and artistic, it engages your brain in a much, much richer way, helping in all its cognitive functions. And, best of all, it is fun!

So, how does a mind map look like? Better than explaining is showing you an example.
Benefits and Uses

Basically, mind mapping avoids dull, linear thinking, jogging your creativity and making note taking fun again.

But what can we use mind maps for?

- Note taking
- Brainstorming (individually or in groups)
- Problem solving
- Studying and memorization
- Planning
- Researching and consolidating information from multiple sources
- Presenting information
- Gaining insight on complex subjects
- Jogging your creativity

How to Draw a Mind Map

Drawing a mind map is as simple as 1-2-3:
• Start in the middle of a blank page, writing or drawing the idea you intend to develop. I would suggest that you use the page in landscape orientation.
• Develop the related subtopics around this central topic, connecting each of them to the center with a line.
• Repeat the same process for the subtopics, generating lower-level subtopics as you see fit, connecting each of those to the corresponding subtopic.

Some more recommendations:

• Use colors, drawings and symbols copiously. Be as visual as you can, and your brain will thank you. I’ve met many people who don’t even try, with the excuse they’re "not artists". Don’t let that keep you from trying it out!
• Keep the topics labels as short as possible, keeping them to a single word – or, better yet, to only a picture. Especially in your first mind maps, the temptation to write a complete phrase is enormous, but always look for opportunities to shorten it to a single word or figure – your mind map will be much more effective that way.
• Vary text size, color and alignment. Vary the thickness and length of the lines. Provide as many visual cues as you can to emphasize important points. Every little bit helps engaging your brain.
• All mind maps begin with a main concept or idea that the rest of the map revolves around, so choosing that idea or topic is the first step. Begin by creating an image or writing a word that represents that first main idea.
• From that main idea, create branches (as many as needed), that each represent a single word that relates to the main topic. It’s helpful to use different colors and images to differentiate the branches and sub-topics.
• Then, create sub-branches that stem from the main branches to further expand on ideas and concepts. These sub-branches will also contain words that elaborate on the topic of the branch it stems from. This helps develop and elaborate on the overall theme of the mind map. Including images and sketches can also be helpful in brainstorming and creating the sub-branch topics.
• Mind maps can be created on paper but are more easily and fluidly created on a computer with mind mapping software such as Inspiration Software®’s Inspiration® 9. Or Novamind

Ex.: Learning and Teaching Mind Map

Sources:


x
The “Gallery Walk” method

THE " TOUR of the GALLERY " Method

It is a cooperative learning technique which encourages students to express their views on the solutions proposed by their peers; it also stimulates thinking, creativity and learning.

OBJECTIVE

To develop a plan that will lead to the completion of a product or concept that stands for the view of all group members.

DESCRIPTION OF THE METHOD

1. The class is divided in groups of 4 or 5 students. The groups solve a task which allows multiple approaching perspectives or multiple solutions.
2. The results/products of the groups are displayed in a visible place, thus creating an exhibition gallery.
3. At a given signal, the groups take the role of visitors and critics and examine the solutions and ideas displayed by their peers; they take notes and finally write down their comments, questions, observations or criticism.
4. After the end of the gallery tour, the groups reunite around their common product/result and read the comments and observation; they can now re-examine the outcome of their work having their peer’s perspective as well.