Industrial Training Institute

"Show me the way to grow!"

2025 Course Offerings

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1 Teaching philosophy

1.1 Charlotte Mason

My teaching philosophy is based on "*Making people curios to learn for themselves.*" It is essentially based on the view of the British educator Charlotte Mason who argued that the essence of education is to

1. Teach the child to **read**
2. Teach them to **write**
3. Teach them to do **math**, and
4. **Make them curious**.

This process repeats throughout our journey and the meaning of reading, writing, math and curiosity depends as the individual growth.

1.2 Knowledge and understanding

The traditional educational is based on **remembering facts**. The way I visualize this is like a person who is standing in the forest while looking at a swarm of insects around them. They then try to remember the name and the location of every insect. This is an overwhelming way of doing things and most people cannot do it. I recently had a discussion with a systems-thinking medical specialist who confirmed that, the reason they look for the brighest students to study medicine is because they have so many things to memorize. The medical training therefore focus on memorizing and not understanding.

I see the correct learning process as one that focused on understanding. For this, look at the forest again with all the bugs in the focrest, but now see a large spider's web in the forest. In this case the bugs will fl into the weband now the observer only has to understand the relative position of the bugs in the web. We can relate this to understanding since the *relationship* between the insects, their location and their contirbution to the overal picture now becomes clear. The true eductional process therefore focuses on the development of this *big picutre*, relational understanding of the *system* insteam of the indivudual facts. In Figure 1 the idea of the insects flying in the forest is presented. Figure 2 presents an illustration of the spider's web in the forest and Figure 3 presents an illustration of the spider's web with the insects caught in the web. The framework allows you to catch all the bugs that are flying around. If a bug flies into the web, it will be stuck in a particular location within the web, but its movement will give away the location of the bug and its position will be known relative to all the other bugs in the web. If we first create a framework for a new area of study we have a structure onto which we can place new thoughts and ideas. We do not have to memorize these facts in the traditional sense. We only have to remember them relative to one another. When we become curious enough we start to look for more connections between the different aspects of the networks (the web) we can catch more bugs (facts) that can be placed inside our framework.

1.3 The teaching strategy

1.3.1 The steps

The teaching strategy is presented in Figure 4. The strategy consists of the following steps:

1. Define the big picture and thereby create a framework for learning.
2. Once the big picture has been defined, cultivate curiosity for the content inside the big picture.
3. Empower the students to explore the big picture and the internal connections.
4. Guide/mentor/assist the student in their discovery process.
5. Actively discover the new content through reflection and writing about it.
6. It is critical to connect theory with application and application back to theory.

Figure 1: Bugs in the forest.

Figure 2: The spider's web in the forest.

Figure 3: Spider's web with bugs.

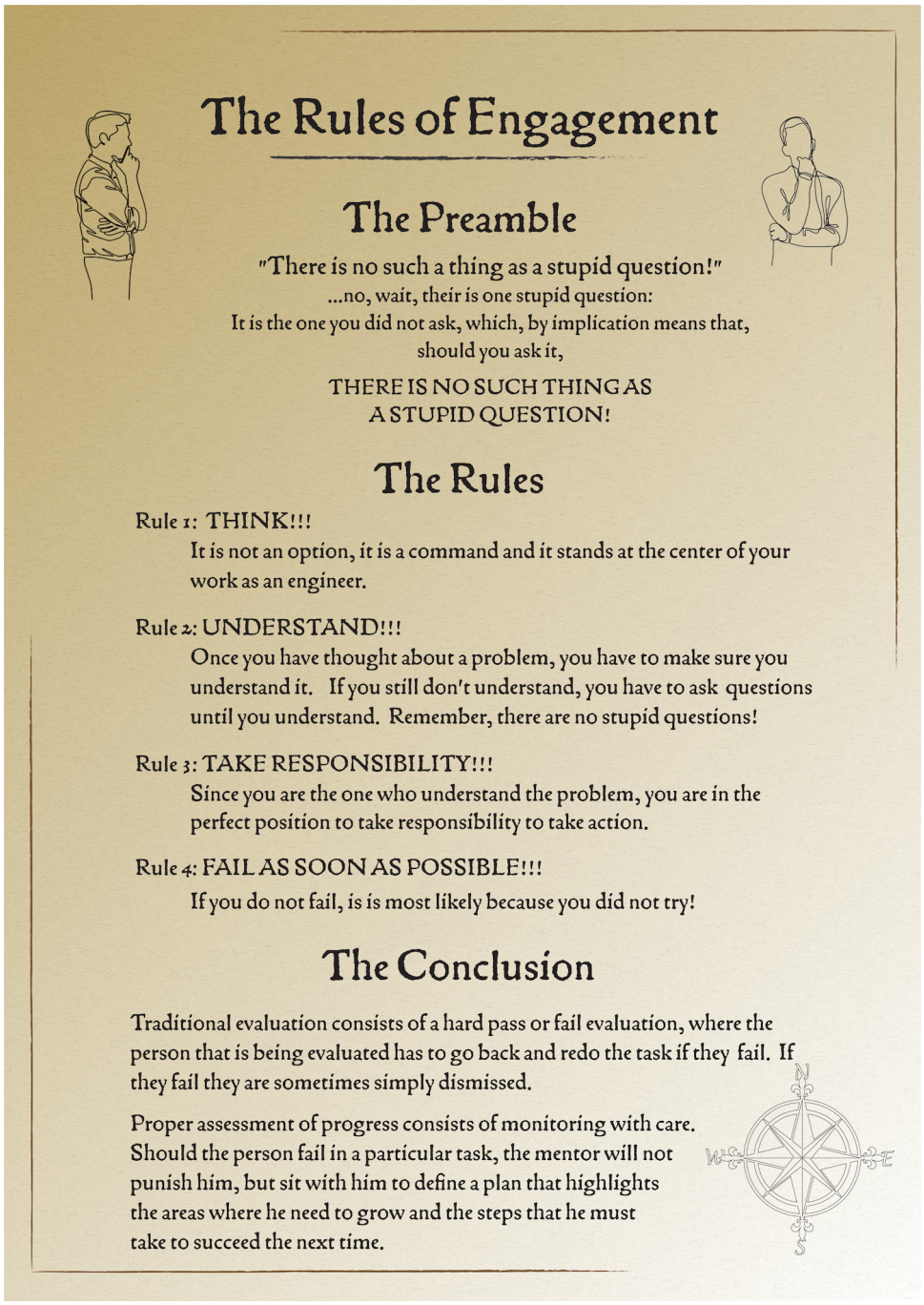
Figure 4: The teaching strategy.

1.3.2 Reflection and Writing

- Your Technical journal is your first line of documentation.
- Make use of “live script” based simulations such as Jupyter Notebooks for instant documentation.
- Consider a Personal Knowledge Management System (PKNS) for crating a framework and defining strong interconnections in the framework. Examples are:
  - Obsidian, or
  - Lattics

1.3.3 The rules of engagement

1. There is not such thing as a stupid question.
2. You have to think.
3. You have to understand.
4. You have to take responsibility for your actions.
5. Your have to fail to grow.



The Rules of Engagement

The Preamble

"There is no such a thing as a stupid question!"
...no, wait, their is one stupid question:
It is the one you did not ask, which, by implication means that, should you ask it,

THERE IS NO SUCH THING AS
A STUPID QUESTION!

The Rules

Rule 1: THINK!!!
It is not an option, it is a command and it stands at the center of your work as an engineer.

Rule 2: UNDERSTAND!!!
Once you have thought about a problem, you have to make sure you understand it. If you still don't understand, you have to ask questions until you understand. Remember, there are no stupid questions!

Rule 3: TAKE RESPONSIBILITY!!!
Since you are the one who understand the problem, you are in the perfect position to take responsibility to take action.

Rule 4: FAIL AS SOON AS POSSIBLE!!!
If you do not fail, is is most likely because you did not try!

The Conclusion

Traditional evaluation consists of a hard pass or fail evaluation, where the person that is being evaluated has to go back and redo the task if they fail. If they fail they are sometimes simply dismissed.

Proper assessment of progress consists of monitoring with care. Should the person fail in a particular task, the mentor will not punish him, but sit with him to define a plan that highlights the areas where he need to grow and the steps that he must take to succeed the next time.

Figure 5: The rules of engagement.

1.4 The lecture

The lessons are based on the classical, the conventional and the unconventional teaching styles of those preceding us.

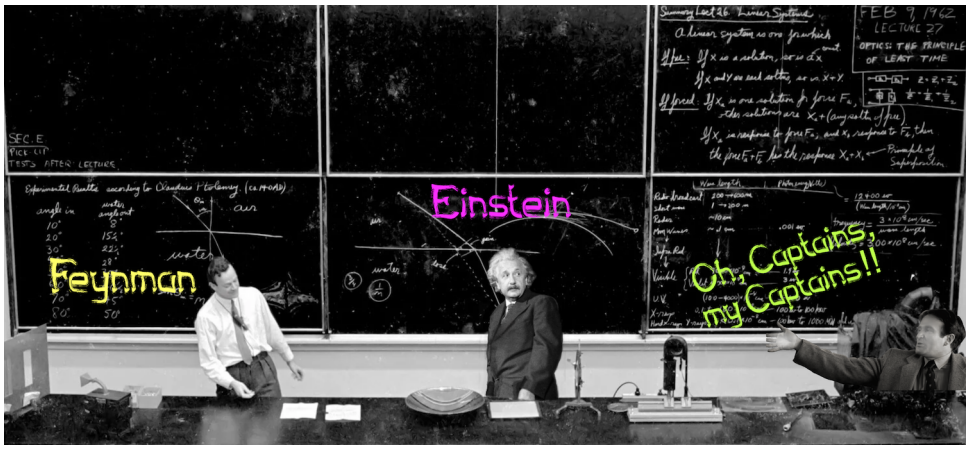


Figure 6: An unconventional group of lecturers.

1.4.1 Dynamic teaching sessions

- No two teaching sessions are the same.
- The aim is to break open the content and create a rich experience of what is means.
- Teaching sessions aim to work with the understanding and response of those present to ensure that all the “lights come on” during that session.
- Sessions are based on direct questioning, and a high level of interaction with all the students.
- The student who gets the most from the lecture is the one who ask the most questions and who interacts the most.
- It is all about knowledge transfer, not just creating listening
- The success of the class hinges on a high level of interaction and participation between the students and the lecturer and amongst the students.
- Questioning and critical thinking of the topic and the lecturer is encouraged as it leads to deeper understanding.

1.4.2 Mentor sessions

- Mentoring is essential to secure the knowledge of the classes and the practical sessions.
- The interactive mentor sessions aims to highlight areas where depth and understanding is lacking and the session then aims to clarify these areas.
- The personal ability of the student will be discovered and developed within his/her unique ability.

1.4.3 What is not not?

It is **NOT**: - About the fancy slides - A session where the theory is recited in great detail. - Where endless technical explanations will be hosted.

It **is about** - the painting of the picture. - It is about the transferring of the thinking process. - Assisting the student to **UNDERSTAND** the context and the application - It is about the assistance to connect the dots. - It is about directing the student to the resources so that he/she can gain depth into their understanding.

1.4.4 Lecture notes

- Some notes may develop towards detailed content
- Most notes will be references to content,

- And mindmaps of interrelated content,
- And the pig picture of what is being taught,
- And internet links to sites explaining the content under discussion.

1.5 Program Value

1.5.1 So, what do I offer that is different?

- **ENTHUSIASM_ about engineering and conveying knowledge**
- My **INSIGHT** of more than 24 years in industry
- My **UNDERSTANDING** of the relationship between the aspects in an unmanned system.
- I will teach you **HOW TO FIND INFORMATION** and to determine what is good and what is bad sources of information.
- I will teach you **HOW TO THINK**.
- I will teach you **how to process it so that you can understand it.**
- A commitment to not only feed you with knowledge, but **to develop you as a person that can best absorb the knowledge and grow as an engineer.**
- I will help you to solve real world engineering problems.

1.5.2 Assesment

Assessment for all the courses will be based on what you **UNDERSTAND** and not on what you **MEMORIZE.**

Assessment is based on:

1. The development of the continuous running project and the growth in understanding as you proceed.
2. The weekly reflection in your mentoring session that acts like a “mini-exam” to show your growth throughout the week and throughout the project.

1.5.3 Inclusion of Industry experts

- The lectures will frequently be supported by the contribution of industry experts.
- The views and experience of industry experts will be incorporated into the courses.

1.5.4 The program is built on mentoring

- Mentorship is not an add-on, but is the foundation of the interaction with the students.
- The mentoring principles is based on the strategy of Pacific Crest in the USA
- Mentoring grows the student as an individual
- It develops the student to become a lifelong self-learner.
- It transfers knowledge from the mentor to the student through the personal interaction.

2 Course: Knowledge Management

This course is based on the following principles:

1. That there is a process (based on a feedback loop structure) that can be used to learn, to plan and to develop your knowledge. This structure forms the foundation of the learning and growing process.
2. That writing is an essential tool to learn and to grow in our professional life and to secre knowledge and understanding.
3. I present the Rules of Engagement as a critical set of principles to focus on in our prefessional growth. These “rules” are:
    1. There is no such thing as a stupid question: any question that come to mind is worth asking.
    2. You have to THINK.
    3. You have to UNDERSTAND.
    4. You have to TAKE RESPONSIBILITY for your actions.
    5. You have to FAIL in order to grow, so failure is OK and encouraged. If you did not fail, it usually means that you did not try.
4. That there is a method of thinking is that strongly coupled to the Rules of Engagement and that can be used by any person in any field of application to develop their thinking and to work through a complex problem.
5. The use of live scripting of immediate writing as a key skill in capturing knowledge as it is created and to present loosing it during your project. Tools that can be used (for technical people) to combine simulation and documentation is discussed and explained. Practicle examples of this strategy is presented.
6. The use of graphical tools for knowledge capture is presented and explained in great depth. the importance of capturing knowledge and ideas in an unambiguous way is presented in this module and it is supported by numerous practical examples.
7. Finally, that, if we know ourselves (our personallity and abilities) and if we develop our emotional intelligence, we can not only grow in our relationships, but also in our abilities to absorb knowledge and grow in our understanding.

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3 Course: Ethics and values

I have a course on Ethics and values that I am busy compiling. The structure is not yet clearly defined, but the essence is to discuss and work through the value system that is often neglected and perhaps ignored due to cultural sensitivity. I have a strategy to directly address this in a direct and encouraging way irrespective of the cultures, or perhaps inclusive of the cultures. These concepts are essential for a healthy work environment, so they have to be addressed.

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4 Course: Personal and Professional Growth

Growth is an aspect that is often neglected in our professional life, but it is argued to be the most important of our lives. Aspects discussed in this course are:

1. Defining your “WHY” and motivation for doing things?
2. Finding what your dream is and what makes you passionate.
3. Defining you life vision.
4. Developing your professional growth plan to work towards the accomplisment of your life vision and making it practical through the development of an annual plan that is supported by bi-annual and weekly reviews.
5. The roles of mentors to support you in your growth plan.
6. The creation of an overlap between your personal growth plan and your professional activities.
7. The concept of and Annual Growth Plan that is support by Key Growth Indicators instead of Key Performance Indicators.
8. How to define every task as a growth experience use the Learning Methodology that was presented as part of the Knowledge Management course.
9. The development of mentors and the estabhlishment of a mentoring framework. In this module mentoring and the importance of mentoring is discussed and a practical guideline is presented to develop mentors and for mentors to grow themselves.

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5 Course: Systems Thinking 1

5.1 Course overview

The objective of this course is to define the following concepts.

1. The overall objective of this course is to guide the student into the realization that **there is a disciplined and structured thinking process** that should be followed to ensure that the intended result is achieved from the design process. This principle is universal to all engineering thinking and is considered to be part of the thinking process of every engineer.
2. The second objective is to emphasize the fact that **the design and final appearance of an autonomous system (actually any system) is directly coupled to the mission it was intended to complete.** You therefore never find something like a “generic system”.
3. The third objective is to guide the student in **the establishment of a set of design questions** that should be asked to develop a system that meets the user’s requirements.
4. The final objective is to guide the attendee into the development of the **thinking processes** that are required to not just design autonomous systems, but to design a system based on an observed problem or defined requirements.

The course is intended to be very “hands-on” and is based on discussions and information sourced from the internet. The first part is more informal whereas the second part is more formal in nature.

NOTE: The course is currently presented with a focus on Autonomous Systems, but it can easily be adapted to another industry.

This course usually runs over 5 weeks with a 2.5 hour lecture once a week. It is presented remotely and consists of a weekly project for every student to deepen the concepts discussed.

5.2 What is an autonomous system?

- What makes a system / vehicle to be defined as “autonomous”?
- Specific examples
- What is the reason for each one of these vehicles’ existence?
- The design and the mission
- The vehicle’s design (how it looks and what it does) is directly coupled to the mission it must perform.
- What is the problem we need to solve?
- Reverse engineering
- Subsystem identification
- The user’s requirements
- Designing a conceptual system
  - Unmanned aircraft (A lot of information)
  - A low-earth orbit rocket launcher (not much info)
  - Autonomous mine vehicle (very little info)
- Understanding the Process
  - The Scientific Process
  - The Engineering Process
  - The Systems Engineering process
  - AGILE# Lecture 3: The Principles
- The principles
  - WRITE IT DOWN!
  - Knowledge management

  - Essential Documentation

- Conceptual/Philosophical Building Blocks
  - Shortcuts, Assumptions, and Quick Fixes
  - SpaceX's approach. . .
  - Avoiding Plasters (Quick Fixes)
- Steps to Handle Complexity
  - Critical Thinking
  - The Value System as the driver in systems thinking
  - Key Concepts
- The Thinking Process
- Applying the Systems Engineering Process
- Metacognition
- The "back-of-the-napkin design" process

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6 Course: Systems Thinking 2 - The principles of Da Vinci

6.1 Course overview

This course is a direct presentation of the book "*How to Think Like Leonardo da Vinci*" by Michael J. Gelb. The outline of the book is presented below. The course if focused on the Seven principles. The objective of the course if to present tried and tested principles to youner engineers in a way of "*This is how Leonardo da Vinci though about this...*" instead of "*These are my ideas...*"

PART ONE: Introduction

- **Your Brain Is Much Better than You Think** – The book begins by encouraging readers to recognize their untapped mental potential.
- **Learning from Leonardo** – An exploration of how Da Vinci's approach to learning can serve as a model for modern self-improvement.
- **A Practical Approach to Genius** – Discusses methods to cultivate genius in daily life.
- **The Renaissance, Then and Now** – Draws parallels between the Renaissance era and contemporary times.
- **The Life of Leonardo da Vinci** – Overview of Leonardo's biography, highlighting his major accomplishments.

PART TWO: The Seven Da Vincian Principles

1. **Curiosità** – An insatiable curiosity and constant pursuit of learning.
2. **Dimostrazione** – A commitment to testing knowledge through experience, persistence, and learning from mistakes.
3. **Sensazione** – The continual refinement of sensory awareness, particularly sight and sound.
4. **Sfumato** – Embracing ambiguity, paradox, and uncertainty to foster creativity.
5. **Arte/Scienza** – Balancing logic and imagination (whole-brain thinking).
6. **Corporalita** – Cultivating grace, fitness, and poise in both body and mind.
7. **Connessione** – Recognizing and appreciating the interconnectedness of all things.

PART THREE: Additional Insights

- **The Beginner's Da Vinci Drawing Course** – Practical exercises to develop artistic perception.
- **Rebirth of a Dream** – The legacy of Leonardo's works and their influence on modern times.
- **Leonardo da Vinci Chronology: Life and Times** – A timeline of key events in Da Vinci's life.
- **Recommended Reading** – A curated list of further readings on creativity, the Renaissance, and personal development.

The book is a mix of biography, philosophy, and self-help, offering exercises and practical methods to apply Da Vinci's thinking strategies in everyday life.

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7 Course: Deep technical courses

The following list of deep technical courses are focused on the autonomous systems and defense sector, but can once again be adapted:

1. Introduction to Guided Weapons / Autonomous systems
2. Applied Systems Thinking
3. Systems Analysis
4. Systems Design
5. Introduction to GNC
6. Flight Dynamics and Simulation
7. Aerodynamics
8. Model-based control design
9. Inertial navigation
10. Guidance and Flight Control
11. Mission sensors
12. Servo controllers
13. 6-DoF by coding
14. GNC Testing