Design Notes

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1 Knowledge, Skills and Competences

These are three foundamental parameters that must be considered while evaluating a student.

1.1 Knowledge

It is an organized **set of information that students learn, understand, store** and use in everyday situations. They can be **either practical or theoretical** in both working and studying fields. They are a way for stating the result of information absorption of the student.

1.2 Skills

A skill is a single **action performed using knowledge and tools**. Skills can be seen as a portion of competences. **Practical and theoretical skills can be used to reach a goal or solve a problem**. Skills can be divided in:

- **Cognitive Skills**: Involve use of logical and creative thinking.

- **Practical Skills**: Invole use of ability and use of materials and tools.

We must pay attention to the difference between **Capability** and Skills. Capability is the possibility to do something, skills are about apply capabilities to perfection the ability with practice and exercise.

1.3 Competences

The capability to **use knowledge, skills and personal attitudes while studying or working**. Competences are about making the **student autonomous solving problems that dynamically change**. There are 4 multidisciplinary axes that are important as competences to become a good citizen:

- Languages

- Mathematics

- STEM (Scientific and Technological)

- Historical and Social

Competences are not only something related to school but also be able to create relationship with other people, be able to solve problems using the rational thinking. **Transversal competences** are the ones **learnt in the everyday life and applied in the school or viceversa**.

Competences to be certified must be observable and should be acquired by gradual stages. Their certification is not permanent but it can be improved thanks to the self-awareness fo the student.

The **school nowdays is cross-competences**, hence students must be able to communicate, design, obtain and expose information, work both alone and in team, ...

2 School: Evolution and Goals

2.1 Goals

The schoold nowadays is not only meant for education but it is about **"training to be", "education to partecipate" and "learn to learn"**. More in detail, "learn to learn" means that the students should learn how to do, how to live toghether and how to be.

2.2 Teaching Evolution

We can split in three macro-temporal lines the evoltion of teaching:

1. **Before 70'**: The aim was teach **knowledge** to students in order to **measure** it with marks. The **schools' program were emanated by the Minestry**.

2. **From 70' to 2000**: The teaching and the learning were done through **targets and goals**. The students were evaluated by the **skills' evaluation** giving **opinions and not marks**. The schools were considered as **autonomous schools**.

3. **From 2000 to Today**: The students **learn by acquiring competences** that are **certificated**. The schools are now seen as **education systems for instruction and training**. For "liceo" schools we have **Nation Indication** and for the technical and professional schools we have **Guide Lines**.

As we said previously, there three way for judging a student:

- **Measure**: Count the number of errors and put a numerical mark.

- **Evaluate**: Provide an opinion after a learning unit.

- **Certify**: Certificate the abilities of a student after a long period of observation.

2.3 Lab Teaching

During laboratory lessons, the **teacher doesn't tech but he organizes learning activities**, better if in groups, **to stimolate students**. These activities can include: search, discover, organize, collect, ... Students can be motivated in some cases to study the subject thanks to the lab lessons. Students are also more **encouraged to try and eventually make mistakes to learn by doing**.

2.4 Practice

'Practice' is foundamental for students since can improve their self-esteem, helping them to learn how to collaborate and how to do, **3 C**:

- **Competition**

- **Creativity**

- **Cooperation**

3 Arduino

3.1 Components

3.1.1 Interfacing

Interfacing represents the **link between devices that operates with different physical quantities**. It can be done thorugh **interfaces** that are composed by transmission channel (cable), 2 connectors and 2 ports. The **data transmission can be either serial or parallel**. Interfaces can be either **proprietary (graphic card) or custom (sensors and actuators)**. Develop a custom interface requires a lot of knowledge in electronic, low level programming, data transfer protocols and communication ports.

One of the most important application for interfaces, is the **physical computing** that is about connecting software and hardware in both direction to sense the physical environment.

3.1.2 Sensor

It is a **device able to sense and event or environment phenomena by converting that analogical data into a digital signal**. A good sensor should not affect the sensed phenomenon, be sensitive only to that phenomenon and be as much precise as possible. Examples: humidity sensor, temperature sensor, light sensor, ...

3.1.3 Actuator

It is a component that moves and controls mechanisms using electric energy, pneumatic force or even human force. Examples: RGB led, buzzer, speaker and motors.

3.1.4 Microcontroller

It is an integrated microprocessor, single chip, that works for a specific application. They have an execution unit, memory module, IO peripherals and interfaces.

3.2 Arduino

Arduino is a programmable hardware platform that comes with an hardware board and a software. Arduino uses the ATmega microcontroller that executes the program written in Arduino language. It has many pros like:

- **Easy to use and Interactive**: Studens can start programming using the simple Arduino IDE. They can use it also to implement different subjects' experiments.

- **Cheap and Open Source**

- **Cross-Platform**

4   Gamification and Game-based Learning

There is a big difference between:

- **Game-Based Learning**: Integrate gaming into learning experiences to increase motivation and engagement. Games are typically about problem solving activities. After the game, the debriefing is very important to make useful the learning process.

- **Gamification**: Use pedagogical system developed as a game for non-game context. The main components of the gamification are:
  - **Points**: They can be also associated with real world rewards such as extra time for a homework.
  - **Badges**.
  - **Goals**: Reaching a goal can help students and encourge them.

The gamification has also been studied for non-school related context, for example to incentivate a specific behaviour in customers. Only in 2014, gamification has been seen as a pedagogical instrument. Students can **experience increasing level of difficulty used to help them in learning and stimulate the problem solving**. Games are also useful to **capture the students' attention**.

Thanks to the game-based learning, we can **fix something to be learnt by the students in a passive way** using the game.

5   Checklist

Once we have decied the topic of the learning unit, we mainly have 2 possible approaches:

- **Traditional (frontal) approach**: The teacher work at home for preparing an explanation of the main concepts and the materials to be delivered to students (slides, books, etc...). At the end of the learning unit, students are verified through a test such as quiz, presentations, etc...

- **Checklist (flipped) approach**: The teacher chooses a topic and splits the class into little groups (5 or 6 max) asking them to prepare a presentation about the given topic. The groups must follow the **checklist**. In this case the lesson is delivered at home and the students' homework is done in class, in this way the teacher can spend more time to **improve the learning environment**.

5.1   Checklist in deep

It is an **assesment tool useful for both students and teachers for the skill development**. It must be **delivered to students before the learning unit**. It is composed by a list of statements to which the student must answer with 'Done' or 'Not Done'. These statements must be clear and specific while guiding the students through the task realization. The checklist provides students with a tool useful for the self-evaluation, documenting the skills, strategies and personal attitudes.

6   Tutor & Orientatore

6.1   Tutor

The tutor's role is to **coordinate the student's school activities, identify their talents to be nurtured, and address any challenges they may encounter**. The tutor has the following responsibilities:

- **Help make lessons more personalized** for students in grades three through five of secondary school.

- **Support students who are struggling in their studies**.

- **Assist students who haven't discovered their talents yet in finding and developing them**.

6.2 Orientatore

The orientatore's task is to **guide the student in choosing a study path that aligns with their abilities and inclinations**. In particular, **students will be able to make these choices with an understanding of the various educational and career paths and the diversity of opportunities offered** by local regions, the business world, and universities.

7 UNICA Platform

The new UNICA platform represents a significant development in the field of education and school administration. It has been introduced with the aim of **simplifying and enhancing the management and access to information for students, teachers, and administrative staff**. UNICA offers a lot of services such as **electronic registers, lesson planning, communication between teachers and students, document storage, attendance monitoring, student assessments and evaluations, and much more**. Students can access their personal area to view their schedules, assignments, exam results, educational materials, and communicate with teachers. Teachers, on the other hand, can use the platform to upload and share teaching resources, record student attendance, assign tasks, and assess student progress. Additionally, parents can access the platform to monitor their children's academic performance, view grades, and communicate with teachers. **Unica also offers significant administrative benefits, enabling simplified management of bureaucratic procedures such as student enrollment, generation of certificates and official documents, and handling of payments and fees**. Furthermore, the platform **facilitates internal communication among various school departments**, fostering greater efficiency and collaboration.

8 DigCompEdu

The DigCompEdu platform aims to provide a coherent **model for teachers to verify and eventually improve their "digital competences"**. We have 6 main areas representing different teacher's activities:

- **Area 1 Coinvolgimento e valorizzazione professionale**: Use digital technologies for the professional growth. These tools are also useful for improving the communication with collegues, students and their families.

- **Area 2 Risorse Digitali**: Find, create and share digital resources for students.

- **Area 3 Pratiche di insegnamento e apprendimento**: Use digital technologies during the learning.

- **Area 4 Valutazione dell'apprendimento**: Take advantage from the digital resources for improving the evaluation step.

- **Area 5 Valorizzazione delle potenzialità degli studenti**: Use the digital technologies for increasing the engagement and modify the lessons according to the students' needs.

- **Area 6 Favorire lo sviluppo delle competenze digitali degli studenti**: Teach students how to use the digital resources in a creative and responsible way.

The digital competences can be **certified into 6 different levels**: A1, A2, B1, B2, C1, C2 (from the lowest to the highest).

9 Privacy

9.1 Personal Data

Personal data are those **information taht can help to identify a student** (or his family) such as surname, address, contact details, disciplinary records (marks and proresses) and so on. These information **remain 'personal' even if the student decides to make them public**. Personal data can be divided into 3 categories:

- **Common Data**: Used for the identification.

- **Sensitive Data**: Special data that are about **more sensitive topics** such as biometric data, religion (if the student do not partecipate to the religion class), health and dietary requirements. These data **cannot be used by the school without the parental consent**.

- **Legal Data**: Data that reveal judicial proceedings.

9.2 Data Processing

Processing is any operation such as: collect, store, consult, modify, extract, compare, use, erase, communicate, etc... Even for those data thare are not part of a data bank.

The school is the **'controller'**, thus it has to secure the contract with the **'processor'** that uses the data. The processor is any **entity that has to process data (even in autonomous way)**, it can be for example a photographer, an e-learning platform etc...

9.3 Lawful Bases

In order to process data, it's important to have valid lawful bases. There exists **6 bases, the most appropriate to use depends on the purpose and the relationship with the individual. Most bases require that the 'data processing' is necessary** (hence the same task cannot be completed without processing). We have to **pick the basis before the processing**, taking account that is not possible to switch from a basis consent to another one. The **'privacy notice'** must include the lawful basis and the purposes of the processing. In case we are processing a special category of data we also have to specify addiitonal lawful basis for them. **If the purposes change we can still use the same basis if the new purposes are still compatible with it**.

'Legitimate interest' is the most common and flexible basis (typically used by the public authorities), it is the suitable basis whenever we are using peaple data in a reasonable way with a minimal privacy impact. This basis also implies a higher risk since we have to protect people's rights and interests. There are 3 elements that compose this basis (can be seen also as requirements for using it):

- **Identify a legitimate interest**: Show that the processing is necessary and do not interfer with the individual freedom/rights/interests. The legitimate interests can be our own interest or third party interest such as commercial interests or individual interests.

- **Balance interests agains the individual's one**: If the processing could harm the individual, then the individual's interests becomes more important than the requested one.

- **Keep track of the Legitimate Interst Assesment (LIA)**: We must include our privacy information and show that we are using the data in the correct way.

Parents should be informed using the **'privacy notice'** about the data usage and collection.

9.4   Tasks in the school

- **Holder**: The school principal and the assistants, they can decide purposes and methods about data processing.

- **Responsible**: DSGA (Direttore Servizi Generali e Amministrativi) who takes care of personal data.

- **Responsible Staff**: Peaple with authorization to process personal data.

9.5   GDPR in the school

Most of processing in the school use the **'public interest' basis** as is in the public interest to have a school that operates in the right way, hence there is **no specific consent needed**. GDPR ensures that data are protected, giving individuals more control over their data (**schools have more responsibilities about students' data**). The GDPR imposes the explicit consent from the parents for those the activities that are not in the normal business of the school, expecially for those which involve third parties. Schools must elect a **Data Protection Officer** and **must ensure that all the third parties are GDPR compliant with legal binding contracts with them**. These contract must specify who will process the data, who will be processed and how it will be done. Any data breach must be reported to the **ICO (Information Commissioner's Office)** within 72 hours.

The introduction of the GDPR should not be a problem for schools since they are still respecting a lot of regulations about data processing. With the **GDPR the individuals now also have the right to ask for the data deletion**.

Schools should document and review periodically all the personal data about students, parents and staff, by checking how they are collected and how they are used. All the staff must be trained according to their roles (including general or advanced GDPR concepts depending on the duties).

All the softwares that uses data must be documented checking they're GDPR compliant.

9.6   Security

Data breaches are not necessarily caused by hackers, they can be also the result of a laptop forgotten on a train. Therefore, **staff members should always use strong password (possibly also encrypting) for protecting data and set auto-lock for their devices**. Staff should also be **trained and aware about phising, ransomware attacks** and the like...

9.7   Classwork and Photos

The teacher can assign work about the student's personal world and based on the teacher' sensitivity these works can be read in public or not. **Final marks are public**. It's possible to **publish photos only with the parent agreement**.

10   Electronic Register

It is a platform where the teacher can **keep track of every student's progress** such as marks and personal considerations. The teacher can **write on it all the activities, the topics explained in class and share additional material**. It represents also a powerfull tool also for **communicating with families**.

11   Dr Abbruzzese Lecture (AKA Riccardo Sottil)

11.1   Bloom's Taxonomy

The Bloom's taxonomy is meant to be **used while developing and delivering a learning unit**, it provides a **tool for teachers to modify the lessons according to all the students' needs**.

1. **Remember**

2. **Understand**

3. **Apply**

4. **Analyze**

5. **Evaluate**

6. **Create**

When we create the learning unit, we should take account of both **intelligibility** and **comprehension**. The **first one is the necessary condition for the second one** (but not sufficient!), hence to achieve them it's important to make the **right linguistic choices**.

   This taxonomy is used in the **mastery learning approach**, so the learning expectations are delivered to the students, who can also have the opportunities to make important decision about their learning. All the **assesments are competency-based**, thus the success is defined by achieving those competences. The **grades** are intent to be used as tool for **facilitating and improving the learning process**.

11.2   Brief Didactic path (Ditattica Breve)

BD is good for situations in which the class is turbolent or when we have short time scheduling (online classes). The aim is to reduce the learning time without sacrificing the knowledge. This can be done thanks to:

- **Vertical Distillation**: The teacher selects the core topics to be covered using conceptual nodes and logical cleaning of the contents.

- **Horizontal Distillation**: The students create logical links between the concepts, dividing the explanation into elementary steps.

11.3   EduScrum

The **EduScrum takes ispiration from the Agile developing method** in which the aim is to produce an incremental work. Therefore, we have time cycles that are repeated until the work is not completed. In the EduScrum, the **class is splitted into groups, each of those with a team captain that shares the role of EduScrum master with other teams' captains and the teacher**. The **teacher determines what should**

be learnt and thanks to the team captains, he will **monitor and improve the learning process. The teacher also has to monitor the single memeber growth**. Each **sprint (cycle) is represented by a learning unit**. This process is typically realized using cooperative tools such as Trello.