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KlimaZirkus - Building Workshop
Four-Dimensional Education implemented in the Danish school system.

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KlimaZirkus - Building Workshop

What is learned in school ought to be useful to people well after they finish school. Approaching any new situation that requires using one's knowledge, whether it is a real-world application or learning a more advanced topic in a given discipline, involves leveraging what one has already learned. In either case, existing knowledge must be effectively used in a new context. The more robust a mastery one has developed of the fundamentals of a topic, the easier it is to leverage it to learn even more.

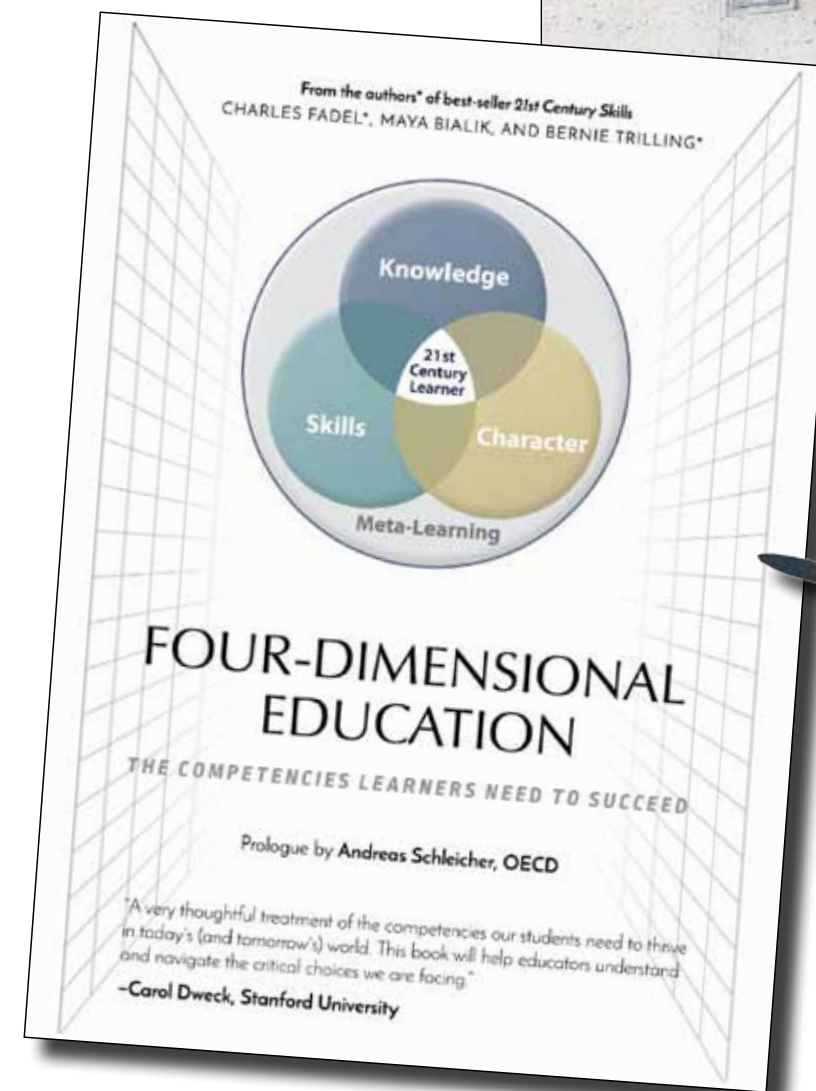
KlimaZirkus-Building Workshop helps students to co-create with mentors from local businesses and use the concept from four-dimensional-education as a framework to internalizing the most important concepts of each discipline and across disciplines. They combine this with innovation processes which equips the students to deal with multifaceted problems and have a more diverse set of tools with which to interpret the world.

KlimaZirkus-Building Workshop introduces students to real world challenges and the 17 SDG's through a learning environment with:

1. Caring relationships.
2. Communication of high expectations.
3. Opportunities for meaningful involvement and participation.

These are all factors that have been identified in schools, communities, and social support systems as positively influencing resilience and grit in the students. Grit is the tendency to sustain interest in and effort toward very long-term goals (Duckworth et al., 2007).

Charles Fadel,
march 2018



Søren Peter Dalby Andersen visits Charles Fadel at Harvard in March 2018



Charles Fadel is Founder and chairman of the Center for Curriculum Redesign at Harvard University. He is a global education thought leader and futurist, author and inventor, with several active affiliations; his work spans the continuum of Schools, Higher Education, and Workforce Development and Lifelong Learning.

KlimaZirkus - Building Workshop

Our society faces a future where new technology, climate challenges and the complexity of issues will increase significantly. Denmark has the potential to become one of the growth centers of the world in solving these challenges, but it will only happen if the education system, the framework for technology development and the sustainability agenda are strengthened. One of the challenges we face is that too few students seek a career within STEM (Science, Technology, Engineering, and Math). Therefore, Dansk Industri, Dansk Metal, and IDA (STEM organizations) have agreed to propose a Danish "Technology Pact". A pact that focuses on increasing the number of students who wish to enroll in a STEM-related education.

In January 2018, Danish Prime Minister, Lars Løkke Rasmussen, has introduced the Technology Pact. The Prime Minister describes the pact as an agreement where business, educational institutions, and the government address this challenge together.

The Technology Pact and KlimaZirkus-Building Workshop share a vision: To educate a generation that has the skills, competencies, personal character, and knowledge that is needed to address complex problems like climate changes.

KlimaZirkus-Building Workshop facilitates the meeting between young people and real-world problems, sustainability, innovation, and curiosity, thereby encouraging them to engage in climate challenges and issues that calls for innovative and sustainable solutions.

KlimaZirkus-Building Workshop promotes sustainability and innovation to students by engaging in co-creation processes between students and local businesses. We seek to understand how iterative processes affect different aspects of the Danish public primary and lower secondary school.

- In which way does the innovation project KlimaZirkus-Building Workshop increase students' innovation competencies?
- What type of learning is generated through a co-creation between schools, local companies, and students?
- How does iterative processes affect students' learning environment?
- What skills are involved in innovation competencies?
- How might KlimaZirkus-Building Workshop affect students' interest and motivation?
- How might KlimaZirkus-Building Workshop and innovation processes affect the students' learning environment?
- What is the link between innovation processes and learning?



How do KlimaZirkus - Building Workshop design a Challenge?

When preparing for our first co-creation the first question we needed to answer was:
What kind of challenges can students address?
and in a co-creation process between students and a local business which learning goal can be connected to the innovation process, the related activities and the knowledge domain? These questions help us develop a framework that will support teachers in establishing clarity and a common language regarding student's learning outcome.



Challenges.

The challenges have to introduce, by a local company, a challenge that can be solved by using an engineering-, design- or innovation process. (Meta-domain)
KlimaZirkus always link the challenge to one or more of UN's 17 Sustainable Developments Goals

KlimaZirkus facilitates the team of teachers so that:

- The team have identified learning goals representing the traditional subject that is involved (**Knowledge-domain**)
- The team have identified academic goals for what innovative concept the students need to understand and use. An example could be the concept persona, diverging or converging (**Knowledge-domain**)
- The team have identified how the students will include visual communication (**Skill-domain**)
- The team has identified learning goals for the characteristics they wish develop in the students (**Characteristic-domain**) An example could be addressing how a student handles adversity.

The CCR framework, Learning objectives, competencies and taxonomy

Our projects often involve teachers with a diverse subject background. This has created a need to develop a better understanding and description of what an innovation competence is. In connection with innovation competencies, we were inspired by Jan Alexis Nielsen and his project "Gymnasiet tænkt forfra" which informs us that innovation skills in an upper secondary school are based on the following five sub-competencies (Nielsen, 2015):

Creativity competence

The ability to interpret an assignment independently, develop ideas and choose the best ideas

Collaborative competence

The ability to work with people, be spacious and consciously assume different roles in the cooperation with others

Navigation Competence

The ability to see what knowledge needs to be collected to solve a task

Actions competence

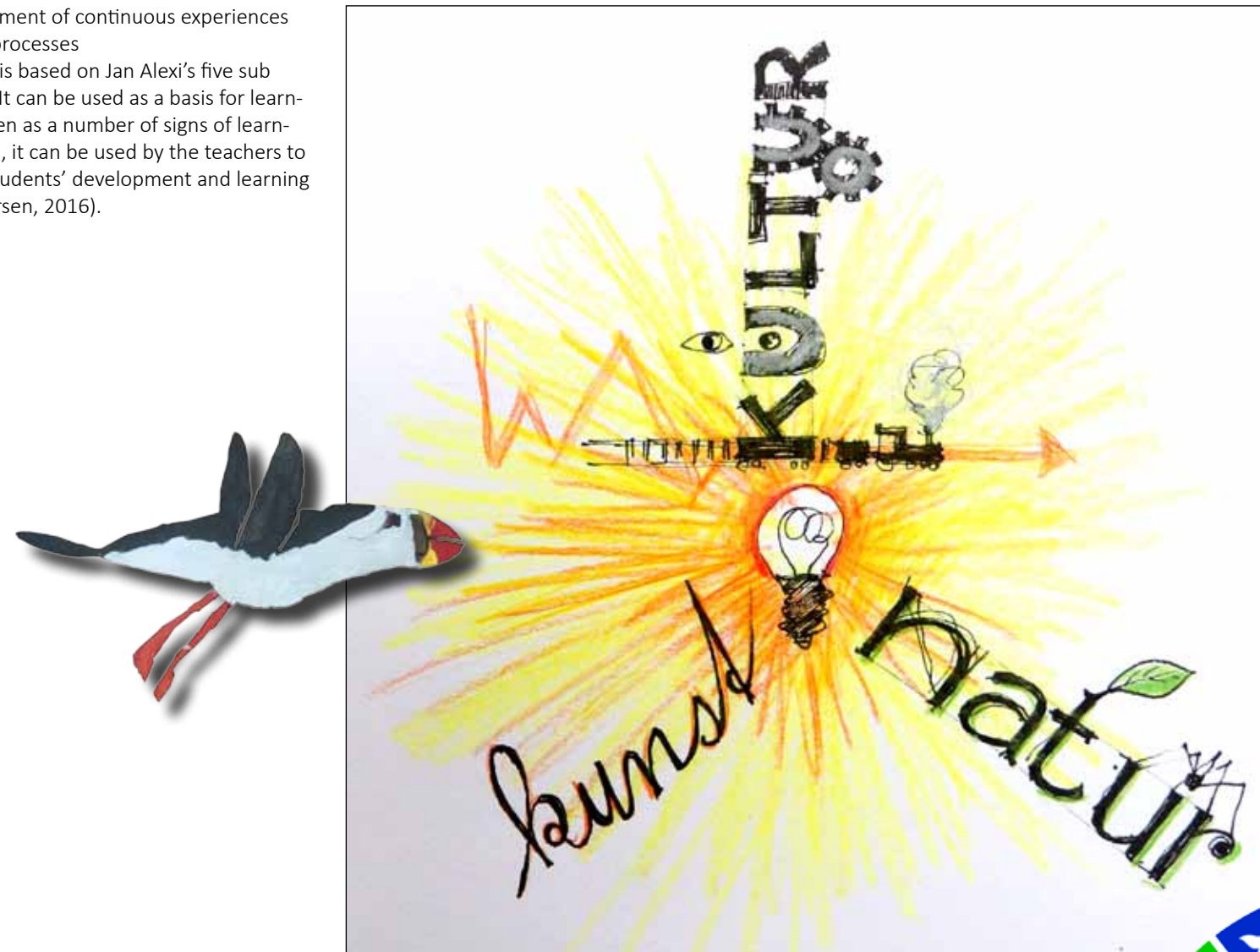
The ability to make things happen and assess a complex situation and take a risk upon your knowledge

Communication competence - The ability to communicate the completed project in a convincing manner.

In my master thesis from 2016, I argue that Jan Alexis Nielsen's description of an upper secondary school's competencies can be used as a starting point for a taxonomy addressed to primary and lower secondary school (Andersen, 2016). It is based on an understanding that competencies are formed through experiences from a subject-knowledge context that has focus on creative and iterative processes. Thus, progression takes place through the meeting of three parameters below:

- Basic and core subject-knowledge in the traditional disciplines taught in the local education system.
- Expansion and development of skills through a meeting with practical issues.

- The development of continuous experiences with iterative processes
- The taxonomy is based on Jan Alexi's five sub-competencies. It can be used as a basis for learning goals or seen as a number of signs of learning. In addition, it can be used by the teachers to evaluate the students' development and learning process (Andersen, 2016).



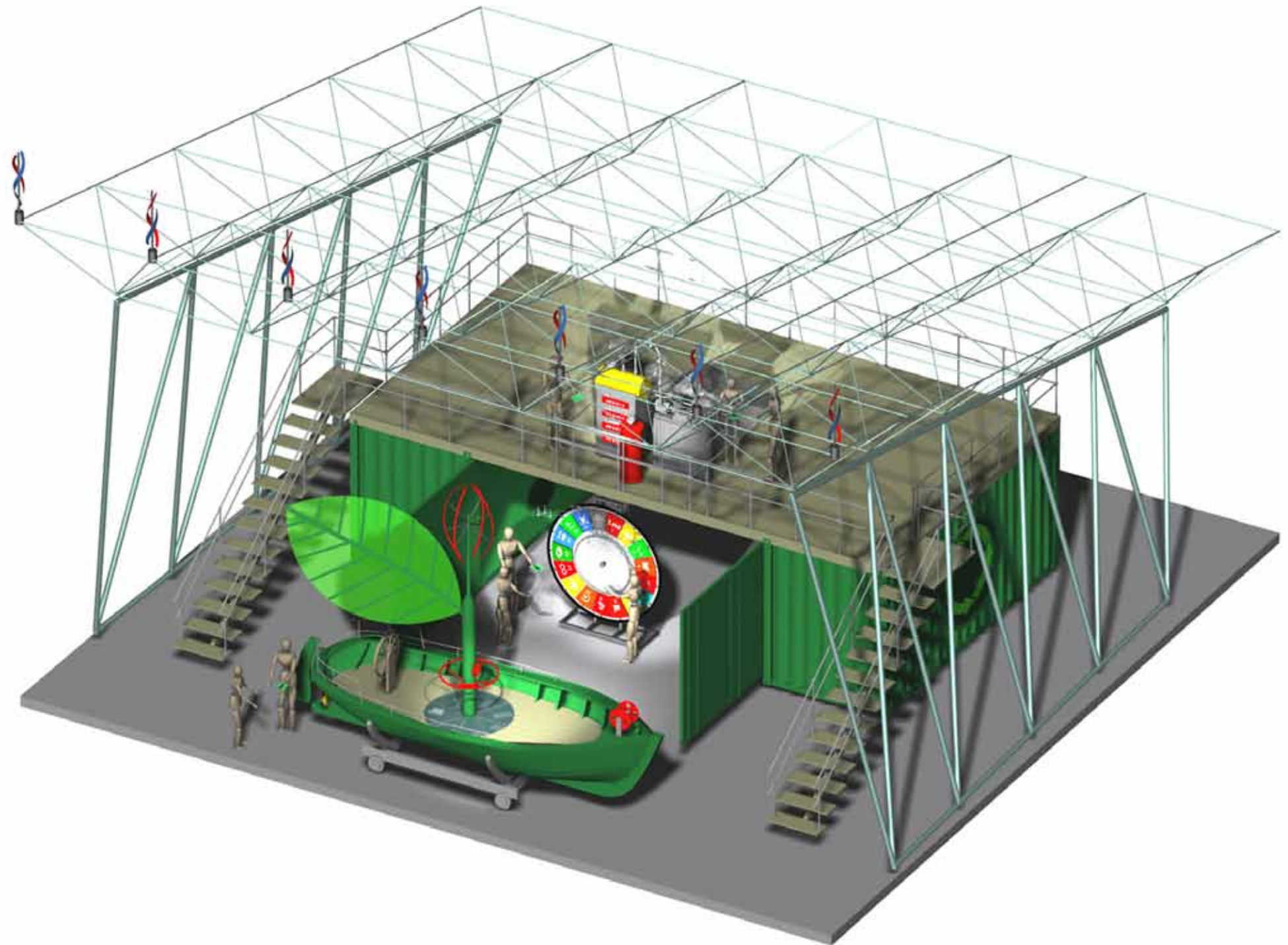
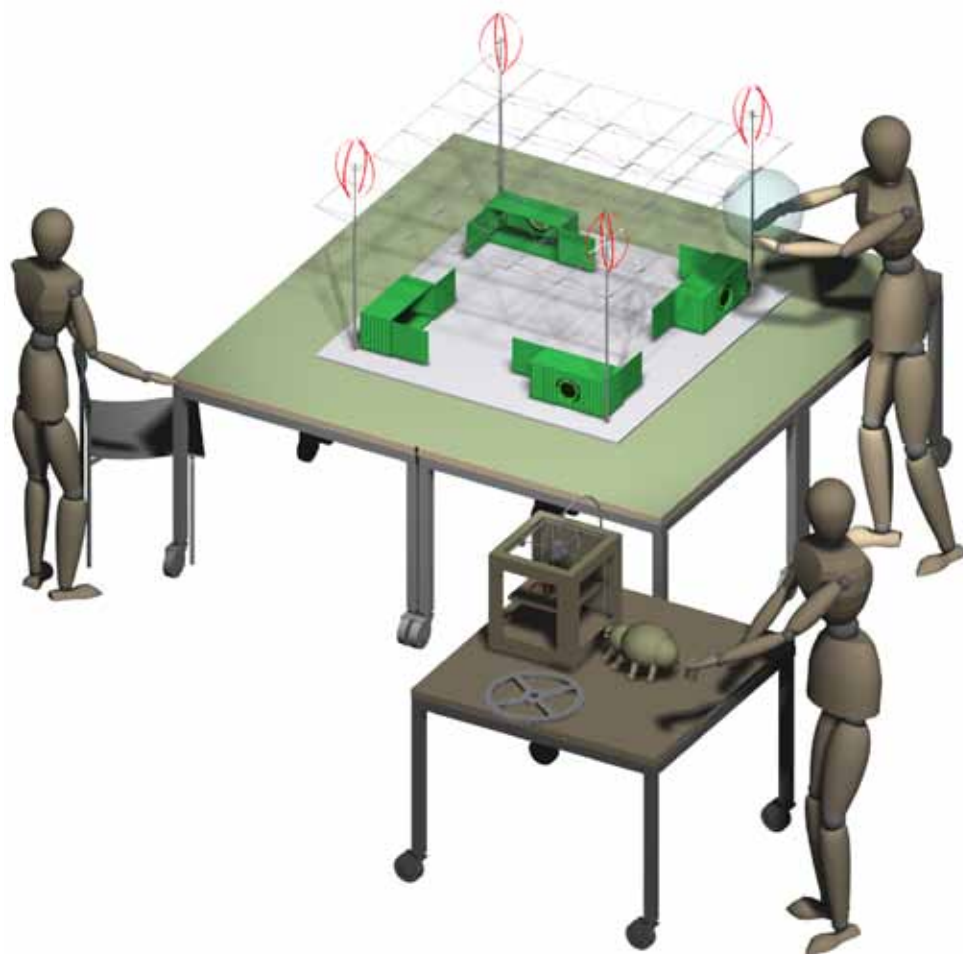
Science, Art, Culture



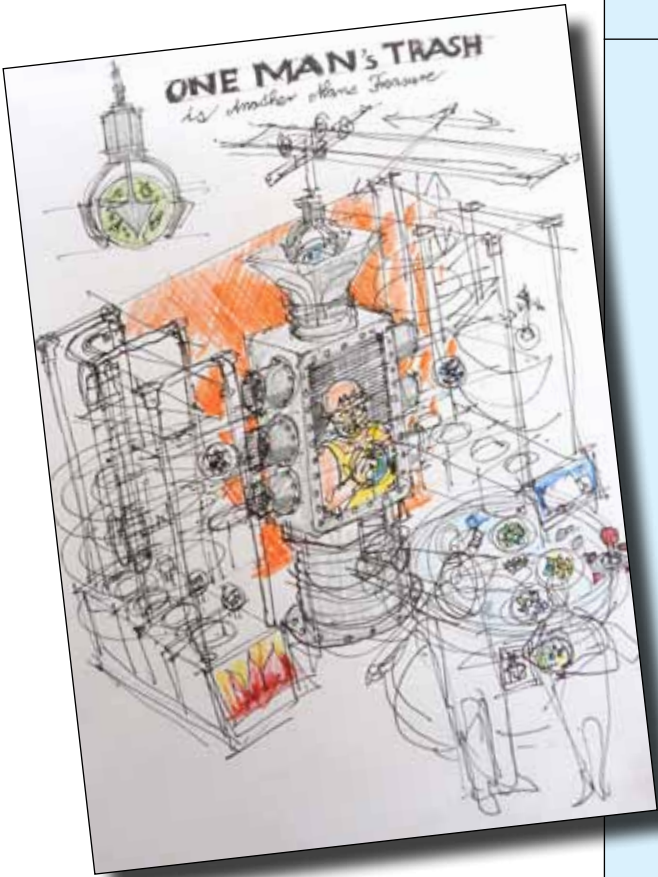
Building Workshop

I hear... and I forget.
I see... and I remember.
I do.. and I understand.

By Confucius



Creative-competences



| Competencies | 1st-3rd grade | | 4th-6th grade | | 7th-9th grade | |
|-----------------------|--|--|--|---|---|---------------------|
| Creative-competencies | Skills | Competencies | Skills | Competencies | Skills | Competencies |
| | <p>The student possesses a basic curiosity.</p> <p>The student do not settle too early on a single idea or one solution</p> <p>The student is able to sort a variety of ideas and solutions.</p> <p>The student should be able to generate new/ independent ideas and solutions.</p> <p>The student should have a fundamental openness to his own and others' ideas and solutions.</p> <p>The student is open and acknowledging alternative ways of solving a given task</p> | <p>The student should be able to generate ideas individually or jointly.</p> | <p>The student should be able to identify issues concerning a person's local and or global life.</p> <p>The student should be able to find different ideas and solutions to a given problem.</p> <p>Students should be able to make a conscious selection among a number of ideas based on specific selection criterias.</p> | <p>Students is able to reach independent interpretations of diverse issues.</p> <p>Students is able to process and evaluate ideas critically.</p> | <p>Students should be able to interpret given issues, for example, by accepting to understand a problem in a new / independent manner.</p> <p>Students is able to develop and improve their own and others' ideas and solutions</p> | |

Figur 1 - (Andersen, 2016)

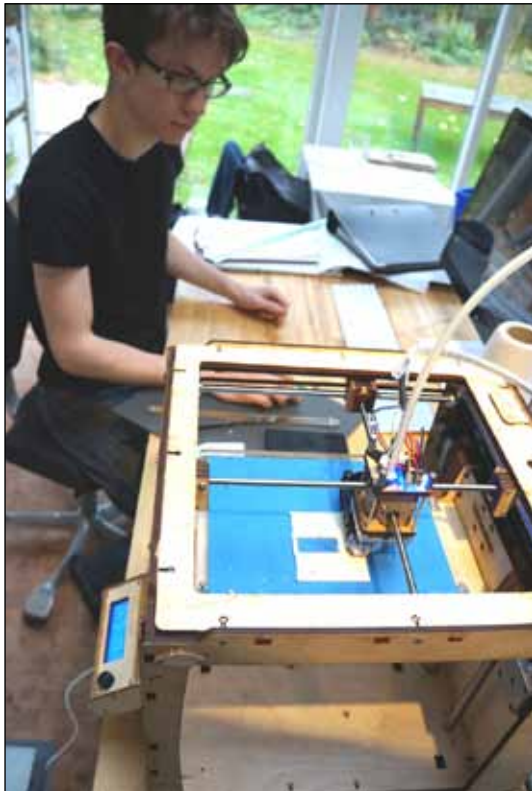
Collaborative competence



| Competencies | 1st-3rd grade | | 4th-6th grade | | 7th-9th grade | |
|----------------------------|--|---|--|--|--|--|
| Collaborative Competencies | Skills | Competencies | Skills | Competencies | Skills | Competencies |
| | The student has a fundamental openness toward others and their engagement. | The student should be able to generate ideas individually or jointly. | The student must be able to take responsibility. | The student is able to be inclusive and flexible in collaborative situations | The student should be able to help plan and coordinate a work process. | The student must be able to take responsibility for and pray for a cooperation to meet the goals and tasks set |
| | The student should be able to recognize the ideas / solutions of others. | | The student should be able to contribute to a constructive learning environment. | | Students should be able to identify how collaborators complement the student's own competencies. | |
| | The student must be able to work with different people. | | The student should be able to provide constructive feedback to collaborators. | | The student should be able to contribute to a functional role distribution in collaboration. | |
| | | | The student must be able to assume different roles in cooperation. | | | |
| | | | The student should be aware of the dynamics in a group. | | | |

Figur 2 - (Andersen, 2016)

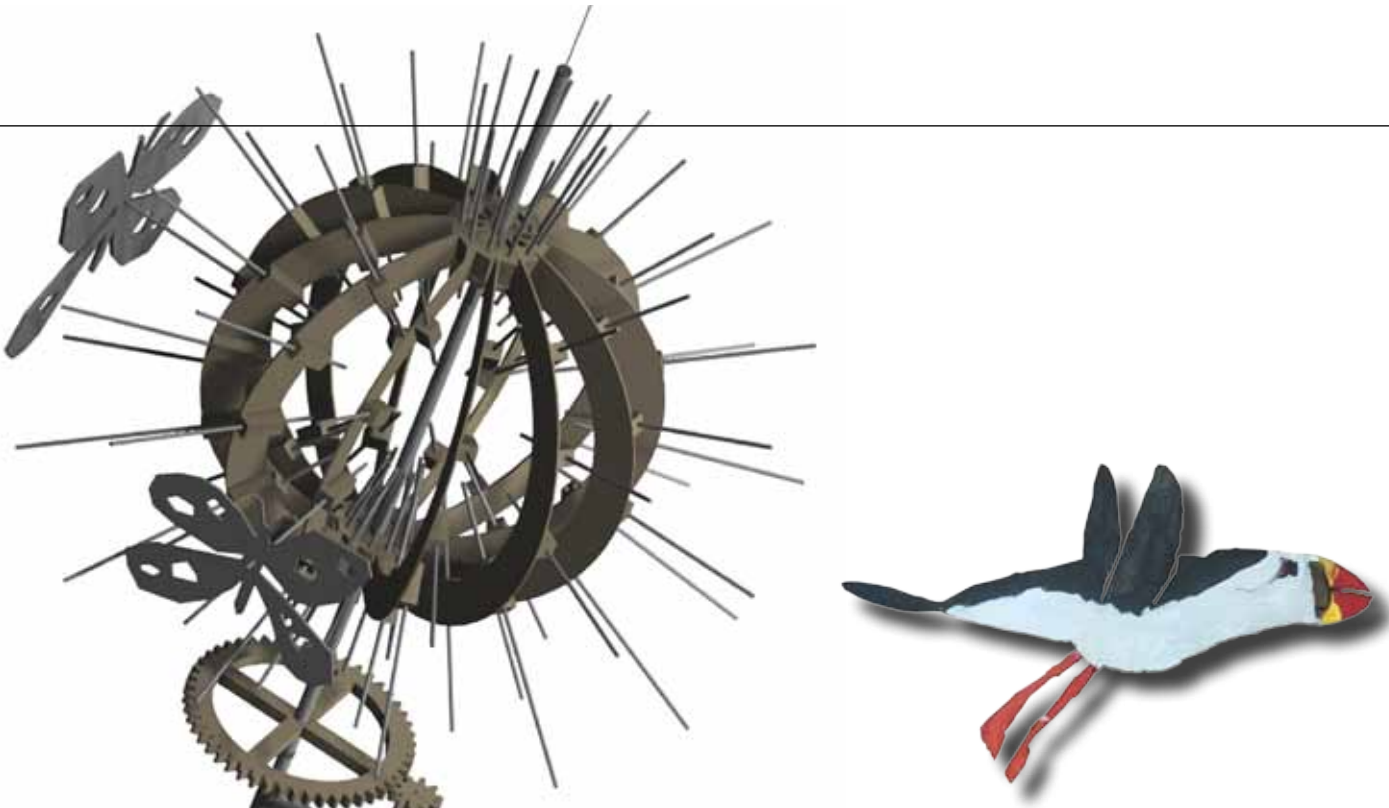
Navigation competence



| Competencies | 1st-3rd grade | | 4th-6th grade | | 7th-9th grade | |
|-------------------------|--|--|---|--|--|---|
| Navigation Competencies | Skills | Competencies | Skills | Competencies | Skills | Competencies |
| | The student must be able to identify which academic content is relevant to the solution of a given assignment. | The student must be able to identify what knowledge the student is missing to solve a given problem. | The student must be able to immerse himself and be aware of when a task calls for immersion | The student should be able to use/transfer his language from the traditional subjects to understand and decode assignments and issues. | The student should be able to work in conjunction with information density. | Students should be able to master complex and iterative-work processes. |
| | The student should be able to sort, structure and prioritize knowledge and information. | | The student should be able to use different methods to create an overview of and structure a workflow | | The student can critically evaluate information / knowledge from different sources | |
| | The student must be able to handle knowledge and information in a functional manner. | | The student must have an understanding of the iterative processes. | | The student should be able to evaluate how given resources are used best. | |
| | | | The student should be able to make decisions concerning the iterative process. | | The student must be able to (professionally) decode an (possibly implicit) problem in a given assignment | |
| | | | | | The student must have a constructive approach to complex work processes. | |

Figur 3 - (Andersen, 2016)

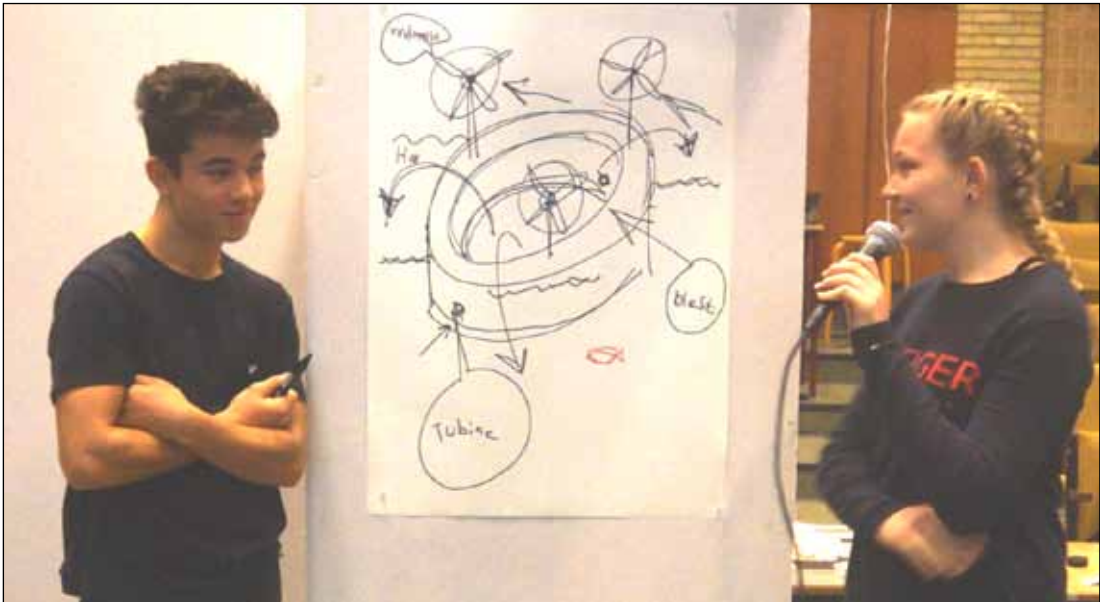
Action competence



| Competencies | 1st-3rd grade | | 4th-6th grade | | 7th-9th grade | |
|---------------------|--|---|--|--|--|---|
| Action competencies | Skills The student should be able to act in relationships that are characterized by uncertainty and where there is a risk of mistakes The student must be able to assess the consequences of a given action | competencies The student must be able to take informed actions. | Skills The student must be able to make informed decisions about what must be done in order to solve a task The student must be able to take an independent initiative The student must be able to identify the most important in a given problem The student should be able to help, coordinate and delegate tasks within a work process The student should be able to assess whether an idea / solution proposal is realizable and / or useful The student should be able to motivate others to act | competencies The student is willing to take a risk and put himself and others in play. | Skills The student must be able to use prior experiences and information to assess when and how to act. The student can actively use his network The student can seek information where it is best available The student is not reluctant to seek information outside the classroom The student must be able to assess when in an iterative process different decision is to be taken The student should be able to implement his / her ideas / solutions, possibly outside the classroom | competencies The student must actively seek information and knowledge, also outside the classroom |

Figur 4 - (Andersen, 2016)

Communication competence



| Competencies | 1st-3rd grade | | 4th-6th grade | | 7th-9th grade | |
|----------------------------|---|---------------------|---|---|--|--|
| Communication competencies | Skills Students should be able to convey their ideas / solutions in an understandable way | competencies | Skills The student should be able to make informed choices about how a given message is best communicated The student should be able to motivate and engage others The student must be able to convince others through their communication The student should be able to use a variety of media in the communication The student must be aware of and use different methods and tools in the communication The student should be able to communicate through visual communication. | competencies The student must be able to master versatile communication techniques. The student should be able to communicate engaging and convincing. | Skills The student should be able to analyze a given communication situation The student should be able to plan a communication strategy The student must be able to communicate to different recipient groups The student should consciously be able to use rhetorical grips in his communication Students should be able to use non-traditional forms of communication | competencies The student must be able to conduct a communication analysis and make informed communication choices. |
| | | | | | | |

Figur 5 - (Andersen, 2016)

Four-Dimensional Education and Klimazirkus Building Workshop

Experience from my teaching career, the research connected to my Master Thesis (Andersen, 2016) and the hands on knowledge I have gained through projects with www.klimazirkus.com all indicate to me that teachers representing different traditional subjects often find it difficult to find common ground when working with iterative processes. In particular, I have noticed a boundary between the STEM subjects and the language/humanity subjects. KlimaZirkus - Building Workshop wishes to solve this by combining our taxonomy of iterative processes (page 4 - 5) with the Center for Curriculum Redesign "CCR framework". We intend to create a framework that allows the traditional subjects to find a common forum when engaging in iterative processes. In other words, the intension is to develop a tool to help teachers unleash the individual team's power and dynamics - despite their diversity and differences in subject background. The following is a first draft on how KlimaZirkus - building Workshop and the CCR framework can complement and build on each other.

KlimaZirkus - Building Workshop is an example of the Four-Dimensional Education theory implemented in the Danish school.

1) The students experience connection between the "real world" and the school.

Regarding what type of learning KlimaZirkus - Building Workshop generates / stimulates has our findings suggested that the classroom cannot replicate an encounter with the real world. KlimaZirkus Building Workshop merge school with the real world in a meaning full context. The collaboration with a local business combined with the innovative processes have a positive effect on the majority of the students' interest and motivation. It seems that KlimaZirkus - Building Workshop has a tendency to generate and stimulate an individual interest. Our research does also reveal that the students' meeting with the complexity of the "real world" forces them to work together and create solutions on the fly.

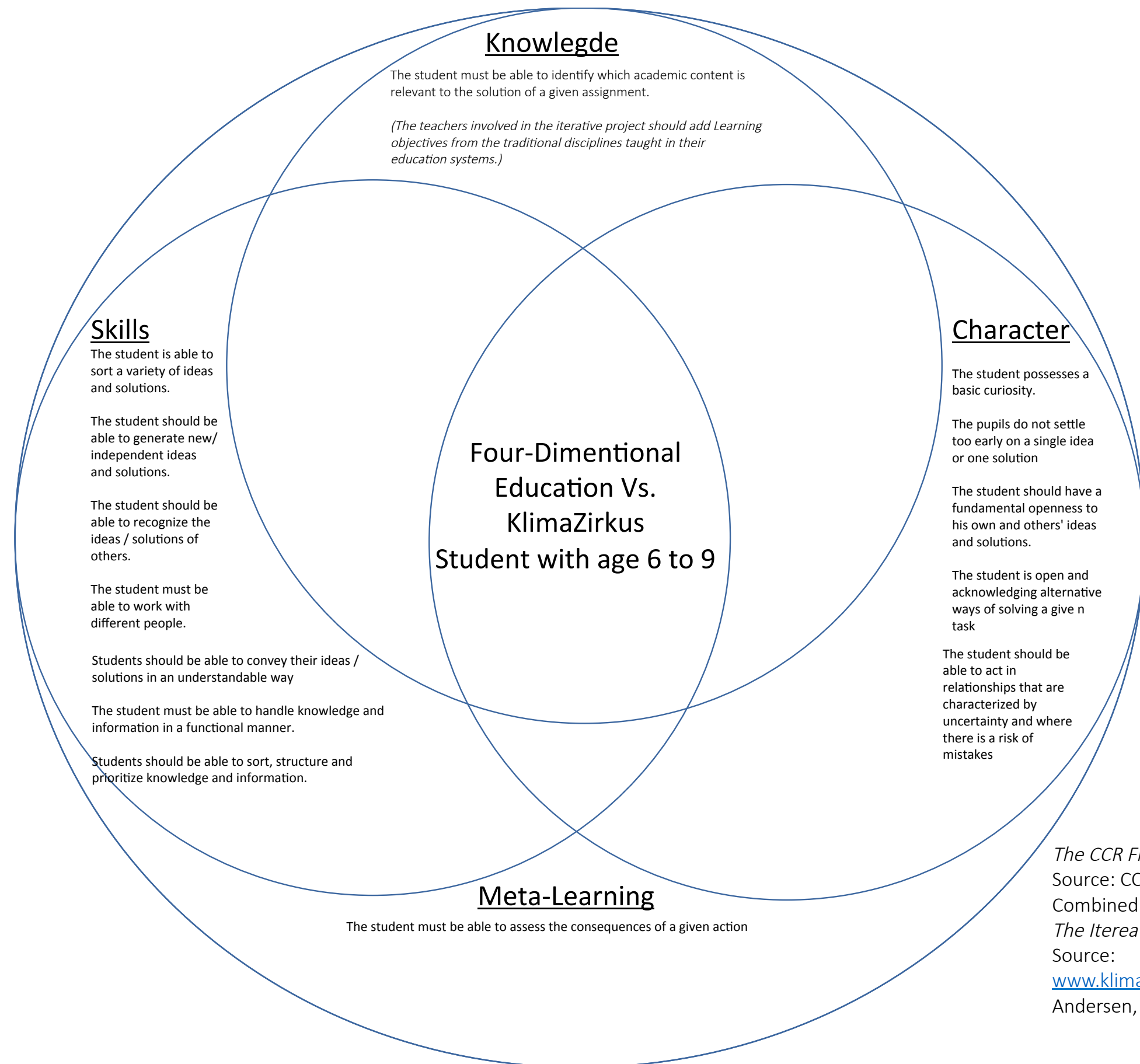
2) Four-Dimensional Education suggest that education is to be viewed as bigger than just knowledge - KlimaZirkus - Building Workshop helps teachers to broaden their view on learning.

Evaluations have disclosed that teachers express that education through innovation is a beneficial focus rather than education for innovation. They focus on the fact that students learn to master and navigate in the phases of the innovation processes. By having focus on the process rather than focus on a perfect product, students are allowed to fail and learn from their mistakes. However, my findings suggest that students were insecure in the beginning of the process as they did not have the necessary understanding of an innovation process. To preclude this I suggest that the mindset and assignments related to innovation processes become part of the daily lessons/curriculum instead of being isolated to an "innovation week" or projects like KlimaZirkus - building Workshop. That apart, my study has showed that education through innovation supports the participation metaphor (Sfard, 1998), a metaphor for learning which perceives an individual as being an active participant in a specific social practice. This leads me to conclude that it is beneficial to consider innovation as a set of teaching methods and techniques that, through student participation, may develop student's generic skills and thereby strengthen the both learning and academics standards.

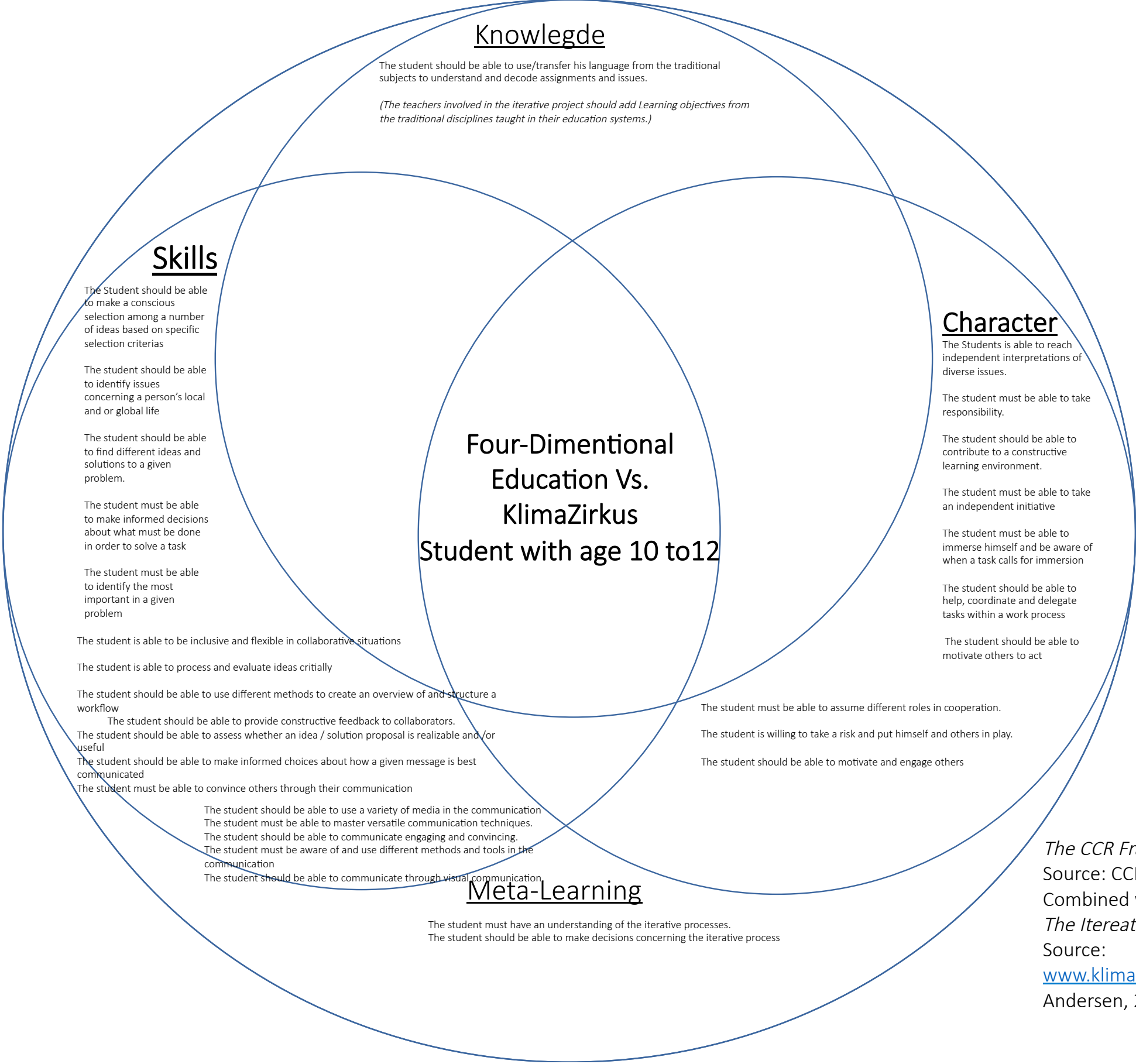
3) Graphic facilitation helps students navigate in an iterative process that draws on all four dimensions of the CCR-framework.

The importance of graphic facilitation was an unforeseen factor. My analysis suggested that the graphic facilitation of the project wall has helped the students make the complex tangible. This enabled them to grasp the complex and uncertain, and provided a calm oasis in the chaos.

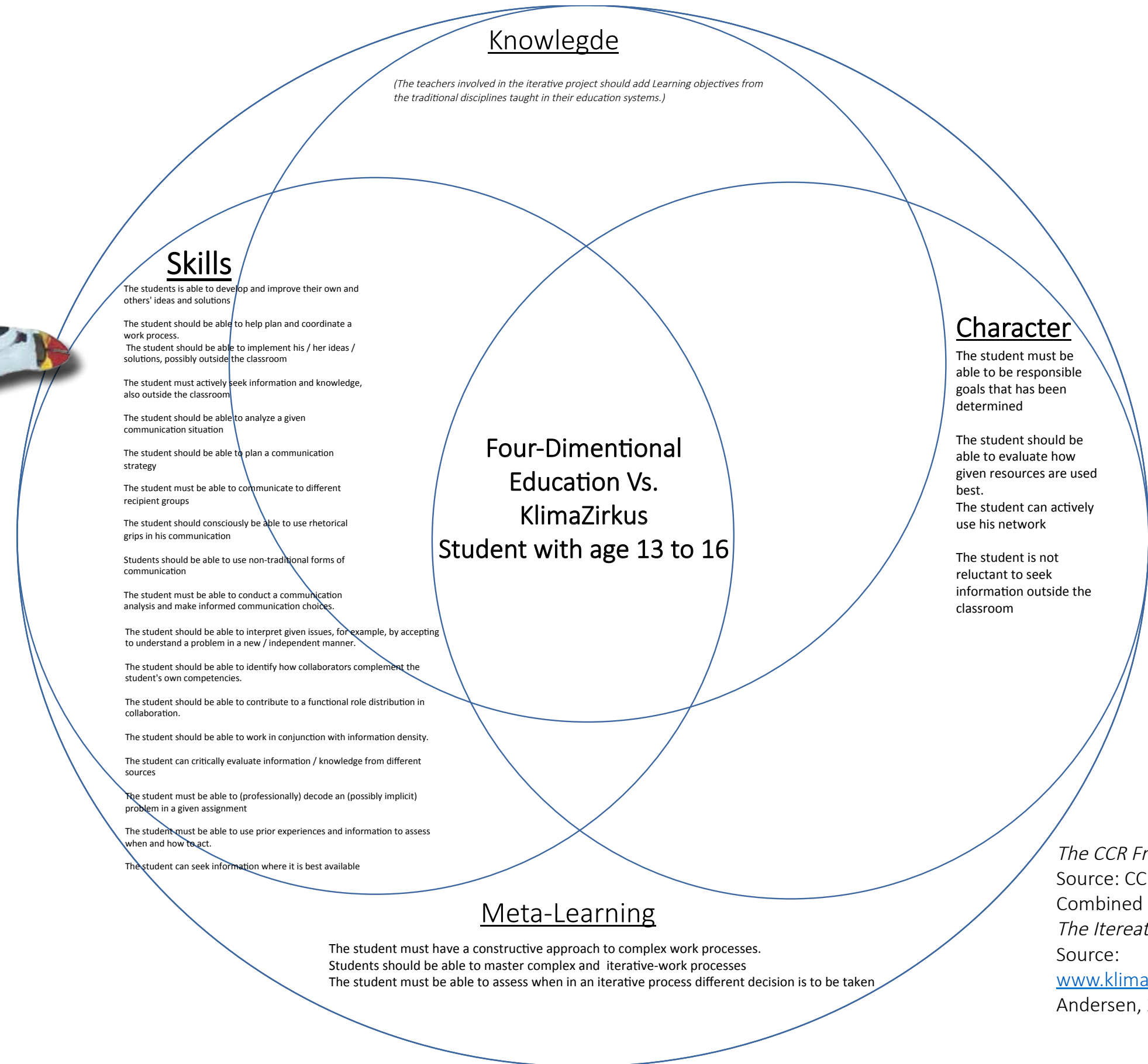




The CCR Framework
 Source: CCR
 Combined with :
The Iterative Taxonomy
 Source:
www.klimazirkus.com
 Andersen, 2017

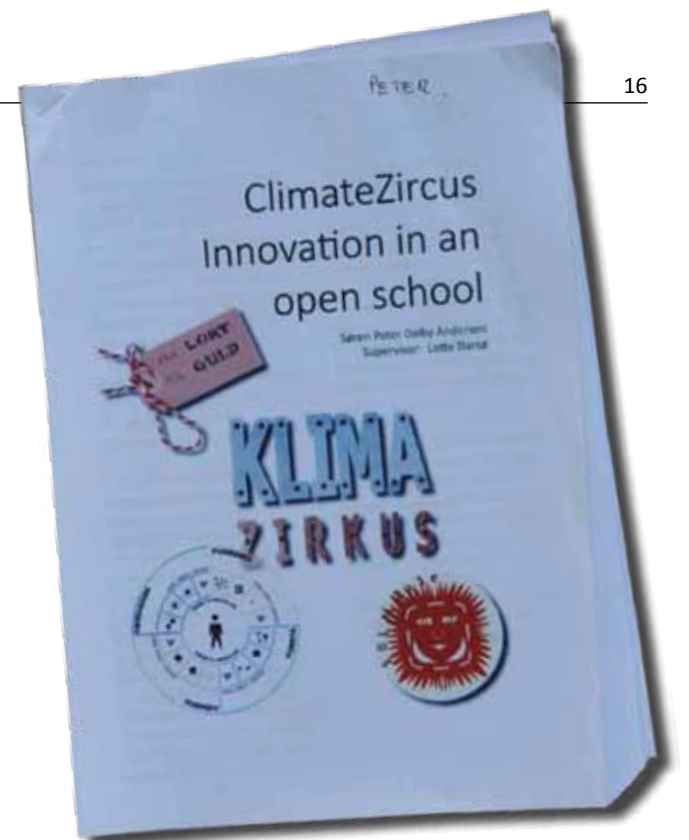


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Klimazirkus - Building Workshop



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