Activities to Explore the Entrepreneurship Mindset at the Higher College for Engineering Wolfsberg, Austria

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Abstract. We are living in a very fast and globalized world. Students should be prepared for the future and more extensive requirements in the labour market. Basic competences acquired during the obligatory lessons are not sufficient anymore. Students need entrepreneurial skills like the ability to work in teams, a sense of responsibility and self-reliance, as well as organizational skills. These skills also need to be interdisciplinary.

That’s the reason, the Higher College for Engineering Wolfsberg (short “HTL Wolfsberg”) is forcing entrepreneurial activities to prepare the students for the future. The aim is that everyone should gain the key set of competences needed for personal development, social inclusion, active citizenship and employment.

We increasingly focus on business games and participation in competitions. Furthermore, cooperations with business experts and funding agencies enable valuable input for our students. This guarantees good support for the entrepreneurs of the future.

Due to the COVID 19 situation we were forced to practice distance learning. It is hard to imagine entrepreneurial subjects can be taught online – but we broke new ground with specific online games.

This paper gives an overview on activities and didactical approaches used by the Higher College for Engineering Wolfsberg within the last years in order to explore the entrepreneurial mindset of their students.

Keywords: Entrepreneurship · Business games · Didactical approaches · Gamification · Competitions

1 Entrepreneurship Education

1.1 Entrepreneurship Education in the EU

The development of the entrepreneurial capacity of European citizens and organizations has been one of the key policy objectives for the EU and member states for many years. There is a growing awareness that entrepreneurial skills, knowledge and attitudes can be acquired and in turn lead to the widespread development of entrepreneurial mind-sets and culture, which benefit individuals and society as a whole.

The European Commission first referred to the importance of entrepreneurship education in 2003, in the European Green Paper on Entrepreneurship in Europe. By
2006, the European Commission had identified a ‘sense of initiative and entrepreneurship’ as one of the eight key competences necessary for all members of a knowledge-based society. The 2008 Small Business Act for Europe, the 2012 Communication on Rethinking Education, the 2013 Entrepreneurship Action Plan 2020, and more recently the New Skills Agenda for Europe, have kept the need to promote entrepreneurship education and entrepreneurial learning under the spotlight. This has led to a wealth of initiatives across Europe.

As highlighted in the 2016 edition of the Eurydice Report on ‘Entrepreneurship Education at School’, about half the countries in Europe make use of the European Key Competence definition of entrepreneurship. A third of the countries use their own national definition and almost 10 countries have no commonly agreed definition at national level. Furthermore, the lack of comprehensive learning outcomes for entrepreneurship education is identified by Eurydice as one of the main hindrances to the development of entrepreneurial learning in Europe.

As a result, there is a clear need to define and describe entrepreneurship as a competence; to develop the reference framework describing its components in terms of knowledge, skills and attitudes; and to provide European citizens with the appropriate tools to assess and effectively develop this key competence [1].

### 1.2 Entrepreneurship as a Competence

EntreComp – The development of the entrepreneurial capacity of European citizens and organizations is one of the key policy objectives for the EU and Member States. Entrepreneurship was defined as one of the 8 key competences necessary for a knowledge-based society.

In the context of the EntreComp study, entrepreneurship is understood as a transversal key competence applicable by individuals and groups, including existing organizations, across all spheres of life. It is defined as follows:

Entrepreneurship is when you act upon opportunities and ideas and transform them into value for others. The value that is created can be financial, cultural, or social (FFE-YE, 2012).

This definition focuses on value creation, no matter what type of value or context. It covers value creation in any domain and possible value chain. It refers to value creation

![Fig. 1. Entrecmp model of the EU](image-url)
in the private, public and third sectors and in any hybrid combination of the three. It thus embraces different types of entrepreneurship, including intrapreneurship, social entrepreneurship, green entrepreneurship and digital entrepreneurship [2] (Fig. 1).

‘Ideas and opportunities’, ‘Resources’ and ‘Into Action’ are the 3 areas of the conceptual model and have been labelled to stress entrepreneurship competence as the ability to transform ideas and opportunities into action by mobilizing resources. These resources can be personal (namely, self-awareness and self-efficacy, motivation and perseverance), material (for instance, production means and financial resources) or non-material (for instance, specific knowledge, skills and attitudes). The 3 competence areas are tightly intertwined: entrepreneurship as a competence stands above all three of these together. The 15 competences are also interrelated and interconnected and should be treated as parts of a whole. We are not suggesting that the learner should acquire the highest level of proficiency in all 15 competences or have the same proficiency across all the competences. The framework does, however, imply that entrepreneurship as a competence is made up of 15 building blocks [2].

1.3 Certificate for Entrepreneurship Education at Colleges for Engineering in Austria

In 2010, the Austrian Federal Ministry of Education established a federal working group, named “Entrepreneurship for Engineers” (Entrepreneurship Education at Higher Technical Colleges). Members of this working group are teachers from all nine federal states in Austria. After some years working on a common understanding of entrepreneurial contents for engineering students, several institutions decided to work together. This was done in order to ensure that the entrepreneurship activities of the school sites are realistic, practice-oriented and scientifically justified. The institutions cooperated to develop and define a certification criteria and a certification process for entrepreneurship education at colleges for engineering. The following institutions are involved in the certification process for becoming a “Competence Center for Entrepreneurship Education in Engineering” certified by IGIP.

- Certification organization: IGIP - International Society for Engineering Pedagogy)
- Scientific partner: Graz University of Technology, Austria
- Operational unit: Federal Working Group Entrepreneurship for Engineers (Austrian Federal Ministry of Education)
- Quality Assurance institution: An Entrepreneurship for Engineering “mentor”: an experienced entrepreneur, who has to accompany the school site over the whole schoolyear
- A special audit team formed out of theses partners make sure that the defined criteria are met.

One important aspect of this specific certification is that not only the school itself is certified, but they also get the permission to hand over certificates to their students if they meet certain criteria. 27 students from the HTL Wolfsberg received this certificate within the last 4 schoolyears.

The HTL Wolfsberg was the first college for engineering to pass this audit in 2016. In the meantime, five other Austrian colleges for engineering are also hold the certificate.
2 Overview of Didactical Approaches and Recent Activities at the College for Engineering Wolfsberg

2.1 Board Game “Create Products”

The board game “Create Products” was developed by three members of the Austrian federal working group “Entrepreneurship for Engineers”. It is focused on the early stage of idea generation of the product development process and aims at getting students more interested in creativity techniques. Four creativity tools (brainstorming, emotive words, inventive principles and trends of evolution) must be used for generating ideas for a further product development of well-known products.

The game concept was presented at the ICL conference 2019. See paper “Entrepreneurship Game Concept “Create Products” - Idea generation for product development with a board game”.

“Create Products” is used in subjects like “entrepreneurship education” or “innovation and product development” at the HTL Wolfsberg. According to our experiences the students like this game a lot.

2.2 Online Simulation “Stratopoly”

The HTL Wolfsberg has been successfully using business simulation games and “simulations” (board games, Lego and workplace simulations) in the classroom for years. This is an attempt to introduce the students to business basics and important aspects of entrepreneurial (strategic) decisions in a playful way. In this way, the pupils can repeat what they have already learned in a playful way and usually understand it better than without simulations. In addition, practical experiences on topics such as income statement, balance sheet, cash flow, investments and important business indicators such as ROS, ROI, ROE are gained.

Even in times of distance learning, attempts were made to continue this type of teaching and to expand it with new approaches. The students adapted very quickly to the current situation and settled well in with e-learning.

https://www.stratopoly.de/

The online entrepreneurial simulation game Stratopoly (especially for the specializations of industrial engineers) was purchased for the laboratory lessons of our school, especially in the area of “entrepreneurial thinking/entrepreneurship”. The students’ economic relationships and entrepreneurial decision-making skills are promoted. During the online lessons, caused by COVID-19 pandemic, around 60 students at HTL Wolfsberg gained experience with the game “Stratopoly” and, took responsibility for the areas of purchasing, production, sales, marketing and financing. In doing so, they had to assert themselves against their competitors in order to ultimately achieve the highest possible company value. This strategy game is played over several rounds, each representing a financial year. After each round, the game result is published, and new decisions are made in all areas of the company. The competition motivates the pupils to learn new strategies and to face the entrepreneurial challenges. This way,
entrepreneurial thinking and understanding of the effects of entrepreneurial decisions are fostered.

Due to the positive feedback by the students, we will continue this form of learning in laboratory lessons in the future.

Below some students’ questions answers, taken from the online feedback, can be found:

1. Question: How realistic was the game to you?
   - “Very much because you have a lot to do with numbers and you also have to work every day. You have to place orders for the grapes, because otherwise you cannot produce, and that means you build losses because the fixed costs always remain the same.”

2. Question: Explain how you have managed your company over the 13 years and which strategies you have chosen?
   - “To grow continuously in small steps with relatively little debt.
   - In the beginning, in order to be able to produce medium-quality wines, I limited my total fixed costs to the bare minimum. Changes have also been made to the staff to get the best possible start. My goal was to be a serious competitor in the wine industry.”

3. Question: How did you like the game, would you play it again, and in which items do you think it could be used?
   - “I would play it again because it promotes economic thinking. I would not recommend any special items for this game, because in my opinion everyone, whether computer scientist or mechanical engineer, should play it once. Because you learn to run your own company, and I think that’s important for the future.”

4. Question: What did you learn from this business simulation game?
   - “Entrepreneurial thinking, planning and investing money properly.
   - How much to consider when running a company.
   - That one should be fixated on a strategy. Either you specialize in quality OR quantity.”

5. Question: How did you do with corporate management? Have there been any surprises you didn’t expect?
   - “If you don’t take a look, you are pretty much in the red. One must not lose track and control.”

2.3 Business Game “inspire! Build Your Business”

In order to create new ways of thinking and perspectives, we use innovative methods of knowledge transfer. One of them is the “inspire! build your business” game. In this business game, we build entrepreneurial skills through innovative, playful ways. The game simulates the path from brainstorming to implementation of the business model.

Starting points of the business game are real ideas by innovative start-ups from Austria and are prepared as mini case studies.

The entrepreneurial practices are experienced by the students themselves. They take on roles as entrepreneurs or investors. This way, real business ideas are critically reviewed and developed further. A reflection at the end of the game combines theory
and practice. Through the game, theoretical concepts such as open innovation or lean start-up or design thinking become fast and simply applied [5].

The inspire! game can be played in different ways of duration and is divided into 4 sessions. This makes it possible to implement the game into the classroom quite easily. The response and feedback of all participants was very positive (Fig. 2).

2.4 Business Simulation “Factory” and “Global Strategy”

Business topics concerning accountant activities like balance sheet, profit and loss statement as well as financial/business key indicators are quite boring for most of the students, if taught in a normal classroom environment.

In order to bring some more action and fun to the students, the teaching faculty of the HTL Wolfsberg decided to use business simulations (mostly board games) in their lessons. After a short market screening, which was done together with another College for Engineering two simulations were purchased from the company BTI in Germany.

The business simulation “Factory” focuses on the understanding of the key performance indicators of a production enterprise, mainly ROI (return on investments), ROS (return on sales) and (CT) capital turnover. Their dependency and the influence of numbers from the balance sheet are reenacted in three game rounds in a very realistic way.

This simulation has been used at the HTL Wolfsberg for five schoolyears now. The feedback by the students was very positive and ensures a basic understanding of the operational performance process and the importance of key performance indicators (Fig. 3).
“Global strategy” is the name of the second simulation of the same German company. This simulation also allows to simulate the competitive situation on the market. Several teams are formed and represent competing companies on the market. The teams need to make strategic decision in the field of product and market development as well as investments in production equipment etc. The challenge of this simulation for a school is that it needs quite more time to be played.

2.5 Card Game “Digital Excellence”

https://digitalexcellence.at/

The “Digital Excellence Navigator” is a practice-oriented methodology to build up knowledge about digitization, to develop specific project ideas and strategies together in a team and thus guarantee an active implementation.

The game can be played with preexisting companies or you can use your own company. Play cards give you impulses to develop the digital business model.

The strategic and operational challenges are then worked out on a specially developed journey canvas and the relevant digitization ideas and initiatives are derived from them. The effects on the possible corporate strategy and vision of the company are checked and adjusted if necessary [6].

This game will last approximately 4 h and every time the students play it, it becomes more interesting (Fig. 4).

Fig. 4. Business model canvas

2.6 Participation in EU Projects

Since 2010 the College for Engineering Wolfsberg has taken part in European funded programs, especially Erasmus + and Interreg projects. Ten project submissions, beside mobility projects in Erasmus +, have been successfully conducted within the last 10 years.

Several of these European projects have a more or less clear focus on entrepreneurial topics, four are mentioned below:

- Project “E-Edu 4.0” (Engineering Education 4.0) Funding program: Interreg IT-AT (Italy – Austria)
Project number: ITAT3018  
Duration: 05/2018–04/2021 (postponed COVID-19)  
Project partner from Italy

- Project “Factory Labs” Funding program: Interreg SI-AT (Slovenia – Austria)

Project number: SI-AT-3–1-076  
Duration: 04/2013–05/2014  
Project partner from Slovenia

- Project “School Companies” Funding program: Erasmus+/KA2

Project number: 2016–1-PL01-KA219–026118  
Duration: 10/2016–09/2018  
Project partners from Poland, Germany and Romania

- Project “Skills4Life” Funding program: Erasmus+/KA2

Project number: 2016–1-ES01-KA219-024933_7  
Duration: 09/2016–08/2019  
Project partners from Spain, Croatia, Cyprus, France, Poland and Portugal

3 Overview of Recent Participations at “Entrepreneurial” Competitions by the College for Engineering Wolfsberg

3.1 Junior Achievement – JA Austria - Junior Companies

JA Europe is the largest non-profit organization in Europe dedicated to preparing young people for employment and entrepreneurship. JA Europe is a member of JA Worldwide®, who have delivered hands on, experiential learning in entrepreneurship, work readiness and financial literacy for 100 years. JA creates pathways for employ-ability, job creation and financial success [7]. Last school year, the JA network in Europe reached more than 4 million young people across 40 countries with the support of 140,000 business volunteers and 130,000 teachers/educators. Every year we have at least one junior company at our school. That way we are also part of that network (Fig. 5).
Junior Companies at the HTL Wolfsberg of the last 2–3 years (Figs. 6 and 7):

- Schoolyear 2017/2018/19:

  ![Junior Companies 2017–2019](image)

  *Fig. 6. Junior companies 2017–2019*

- Schoolyear 2019/20:

  ![Tom and J Junior Company](image)

  *Fig. 7. Tom and J Junior Company*
Our this year’s junior company developed innovative salt and pepper shaker with customized individual laser print.

According to the feedback of the students their company was like in real business life - the team had to endure ups and downs during the project. Nevertheless, the students have been highly motivated and the output and success of all the company paid off for all the exertions.

3.2 SkillsAustria (Federal Championships in Entrepreneurship Education)

The national secretary within the Economic Chamber organization, SkillsAustria coordinates the Austrian state competitions which are held to qualify candidates for WorldSkills and EuroSkills. This is organized in cooperation with the federal guilds and professional associations of the federal sections for Crafts and Trade; Tourism and Leisure; Industry; Information and Consulting; as well as with the various VET schools and colleges. In January 2020 two students of the HTL Wolfsberg took part in the Austrian Skills Championship in Entrepreneurship! (It was already the second time – after 2018 - that a team of the school participated in this competition).

The championship competition lasts 2 days and the attendees have to build up a business model and all elements of a business plan for a business idea.

The basis is a random election of one of the 17 SDG’s (Sustainable Development Goals). For this SDG a basic product or business idea has to be developed and for this idea all elements for a business plan have to be worked out and presented by the students. Our teams chose SDG No 5 which stands for “Gender Equality”. The two students developed a business idea to connect elder and younger people to get IT support. After the final pitch our team reached the 4th place.

3.3 Moonshot Pirates

Encouraging young minds to dream big & to walk their own path by fostering moonshot thinking & sparking the entrepreneurial spirit is another important topic for our students.

We live in one of the most exciting times in history. Now and for the decades to come, everyone has the opportunity to contribute to shaping the future world. It’s up to every person to create their one future. “Moonshot Pirates” don’t care about conventional rules and limits. They follow their own paths. An important feature for them is to leave a positive impact on the planet and modern society.

The challenge is based on a 3-day bootcamp and includes the following content (Figs. 8, 9 and 10):
One team of the HTL Wolfsberg took part at the bootcamp in Tainach (Carinthia) and reached the first place out of 35 competitor teams.

After additional coaching sessions and expert advice, they founded their own business and are already quite successful, even before graduating from school.

In the meantime, the two students have also been invited to take part in a new TV-show format of the German/Austrian TV channel “Puls4”. The title of the is “2 min – 2 mentors”. The episode has already been recorded and should be broadcast in autumn 2020 (Fig. 11).
4 Results and Conclusion

The HTL Wolfsberg’s activities in the area of entrepreneurial education, the promotion and acting of entrepreneurial thinking of its students and teachers as well as the cooperations with companies were honored with the award “The Entrepreneurial School 2020”. This award recognizes Europe’s best schools in the implementation of “Entrepreneurship Education” and has been awarded for the sixth time by “Junior Achievement Europe”.

For each EU country only two schools are awarded. In addition to that, the HTL Wolfsberg is also nominated for a special prize for vocational schools for which only two schools are selected across Europe.

The ceremonial delivery of the certificate should take place - as far as possible due to COVID-19 - at a large event in November 2020 in Berlin as part of the so-called “Entrepreneurial Week”.

The teaching faculty and management of the HTL Wolfsberg is convinced that supporting the entrepreneurial skills of its students and participating in entrepreneurial competitions is a strategic, very important basis for ensuring self-esteem, courage and self-confidence as well as the employability of young people. Belief and working on your own ideas are an essential basis for the further development of our society and cannot be encouraged early enough (Fig. 12).
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