

A Social Network Game for Encouraging Girls to Engage in ICT and Entrepreneurship – findings of the project MIT-MUT

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Abstract: Throughout Europe women are still underrepresented in the field of information and communication technologies (ICT). This is particularly true for female entrepreneurs in the ICT sector. The research project MIT-MUT addresses this issue by exploring new ways to encourage girls in choosing a career path towards ICT and entrepreneurship.

The target audience of MIT-MUT is girls aged twelve to fourteen – a time where they stand just before their first decision, and take initial steps towards their future vocation. Through a literature analysis and qualitative interviews at the beginning of the project insights into preferences and needs regarding their lifestyle and career aspirations were gained. Girls at this age, for instance, have a strong affinity towards digital media and a high digital competence. They frequently use social media networks and regularly play digital games. However, despite all this media affinity these girls reflect gender stereotypic behavioural patterns regarding their intended career paths.

The goal of MIT-MUT is to broaden the career perspectives of girls, increase their self-esteem and support them to discover the competences they already possess. To accomplish this the MIT-MUT game was developed, a seven week long live challenge which combines gamification, social and game based learning. The core and central communication platform of the game is a social media network called Se³N (Social enterprise education entertainment Network). Within the challenge girls have the opportunity to try out their own skills in the areas of ICT and entrepreneurship. Their main task is to come up with an idea for a mobile app aimed at a youth target group and then realize this idea as a paper prototype. In the Se³N these tasks are embedded in a narrative context and the challenge can also be seen as a big role playing game. Members of the MIT-MUT team play the role of the fictional character Rachel Lovelace, a successful IT-entrepreneur who seeks creative heads for the development of a new mobile app. Girls who face this challenge form teams and act as small innovative start-up companies, where every member takes up a different role, such as manager, head of communications or graphic designer.

On the Se³N teams get certain assignments from Rachel and upload their contributions to the challenge. The girls can also communicate with each other, Rachel, their teachers and role models. To foster the girls' motivation during the challenge a gamification system is integrated in the social network and at its end four winning teams are elected. Skill based minigames also provide an additional opportunity to discover unrecognized abilities and talents.

The alpha-version of the MIT-MUT game was first tested in autumn 2015 with 65 students at six schools throughout Austria. This paper presents experiences of the implementation phase of the challenge as

well as the girls' contributions and interactions within the social network. It also describes the findings of the final evaluation process, which gives insights in the actual impact and success of MIT-MUT.

Keywords: ICT, entrepreneurship, gender, girls, career guidance, social learning, game-based learning, gamification

1. Initial situation

MIT-MUT stands for *Mädchen und IT – Mädchen und Unternehmerinnentum* or in English *Girls and IT – Girls and Entrepreneurship*. In German the abbreviation can also be read as “mit Mut” which translates “with courage”. This way the title outlines the goal of the research project: to encourage girls aged twelve to fourteen to engage in ICT and entrepreneurship, foster their self-esteem and support them to discover their own competences.

Recent data shows the need for action throughout Europe. “Out of 1,000 women with a bachelor degree in Europe, only 29 hold a degree in ICT (compared to 95 men) whilst only 4 eventually work in the ICT sector.” (European Commission, 2013) While women are underrepresented in managerial and decision-making positions in general, this is particularly true for entrepreneurship in the ICT sector. In Europe only 19,2% workers in the field of ICT have female bosses. In the non-ICT sector the percentage lies at 42,2%. The reasons for this imbalance are diverse. Cultural traditions and stereotypes regarding the role of women in society, internal barriers such as socio-psychological factors or external barriers like the lack of role models in the ICT sector contribute to this situation. However, for long-term growth and economic sustainability women’s active participation in the ICT sector is crucial. (European Commission, 2013)

In MIT-MUT we understand gender as social construct, which is created and recreated by individuals in everyday interactions. In this respect gender roles can be broken up and are accessible to change and transformation. (Gildemeister, 2008) Girls aged twelve to fourteen stand just before their first decision and take initial steps toward their future vocation. First and foremost, they have to choose the school type for their future educational path – usually made together with their parents and under the influence of the peer group. Also school can play a very important role at this point and has the opportunity to provide gender sensible career guidance. This is where MIT-MUT steps in.

2. Project outline

The project MIT-MUT started in August 2014 with literature research and a qualitative analysis to gain insights in the needs and preferences of the target group. Besides students, teachers were also involved in this phase. Some of the main findings regarding lifestyle and career aspirations revealed that girls at this age have a strong affinity towards digital media and a high digital competence. They frequently use social media networks (especially WhatsApp) for communication with friends and classmates and play digital games regularly – primarily on their smartphones. However, they reflect gender stereotypic behavioural patterns regarding their intended career paths. (Hager, et al., 2015)

Based on these findings and through an iterative design process the didactic concept and an alpha-version of the MIT-MUT game was developed. According to the everyday reality, interests and preferences of the target group we choose to follow a gamified approach with a strong focus on social media and social learning. Over seven weeks in autumn 2015 the MIT-MUT game was implemented and tested with 65 students in six partner schools throughout Austria, followed by an evaluation process. The following chapters of this paper will give insights into the chosen methods within the didactical concept, outline the MIT-MUT game and finally summarize the actual impact and acceptance of the game.

3. Our approach

According to Marc Prensky students of today grow up as so called digital natives:

“Our students today are all ‘native speakers’ of the digital language of computers, video games and the Internet.” (Prensky, 2001)

Digital media belongs to our target group’s everyday life and is used in an intuitive and natural way. Almost every girl aged twelve to fourteen owns a smartphone and uses the internet regularly, especially for communication purposes. Also digital gaming is popular. (mpfs, 2015)

Digital Games offer a wide range of possibilities and challenges, like cooperation, competition or the use and improvement of cognitive and motoric skills. While the variety of games is enormous, well-made games have one thing in common: they foster motivation.

„The same engagement present when children play games can be when young people play computer games. Motivation is high and they play for hours.” (Pivec, 2008)

Motivation is also the key for successful and joyful learning in school. The idea behind Game Based Learning (GBL) and gamification methods is to capture the motivational factor of games to achieve a certain (learning-) goal. The pedagogical potential of digital games (e.g. Gee, 2014) as well as benefits and limits of GBL methods (e.g. Linderoth, 2010) have been explored thoroughly. The challenge lies within integrating GBL in everyday teaching practices and also from teachers who are not familiar with GBL methods. As it will be described in the following chapters, the approach of MIT-MUT is to guide the girls through the game via an external game master and include their teachers as mentors.

When using digital media and the internet our target group is not only composed of passive consumers. Creating and sharing content has become a daily routine and they frequently use social media tools for communication especially with their peer group. (Jenkins, 2006) By including a social media network as an essential part of the MIT-MUT game we want to capture this enthusiasm within a pedagogical context.

4. The MIT-MUT Game

The core of the MIT-MUT game is a social media network, realised with Yammer (Microsoft). As Yammer is commonly used for private communication within organizations it provides the necessary features for the implementation of the MIT-MUT game such as suitable privacy settings, a closed network, the ability to define groups and a video upload function. The MIT-MUT social network was given the name Se³N which stands for “Social enterprise education entertainment Network” and describes what the girls encounter during the participation in the challenge:

- *Enterprise:* The MIT-MUT game has the goal to give the students an understanding of the operational tasks within a company, especially from the perspective of a leading position. Acting out entrepreneurial skills is a crucial part of the game.
- *Education:* MIT-MUT can easily be integrated within the curriculum of the Austrian middle school, especially in career guidance, computer science or art classes. Besides the competence oriented challenge activities, within the Se³N the girls can find information about possible career pathways in the ICT sector and have the opportunity to get in contact with the so called MIT-MUT experts. MIT-MUT experts are women who work in the ICT sector, especially as entrepreneurs. They are presented as role models with video interviews and a written profile with certain questions about their career.

- *Entertainment:* With a game based learning approach, gamification elements and the embedding of the challenge within a social media network we aim at fostering intrinsic motivation and rendering learning a rewarding and joyful activity.

The success of every social media network stands and falls with its users. One of the biggest challenges in the concept of MIT-MUT was to actively engage the 65 participating students from six schools over a period of seven weeks. To achieve this goal, the MIT-MUT game was embedded in a narrative context. As an entry to the game the students watch the first video message from Rachel Lovelace, played by an actress. Rachel is a successful entrepreneur from the U.S. who wants to build up a company in Austria with the goal of developing an innovative app for youth as a target group. She is seeking a creative and innovative team and for this purpose she hosted the MIT-MUT challenge. To be able to participate the first task for the girls is to join the Se³N and set up their profile. From this point on the Se³N serves as the central communication platform for the participants of the challenge. Beside the students and Rachel Lovelace, the teachers, the MIT-MUT project team members and the MIT-MUT experts also have a profile on the Se³N. To ensure a certain privacy the Se³N is non-public and closed for external persons.

The main tasks for the girls are split up in five phases over seven weeks. At the beginning of every phase a new task list together with a video message from Rachel is revealed. Thereby the challenge gets the necessary live characteristic. With that comes the need for a persistent support. Therefore, the character Rachel Lovelace was created. In Rachel Lovelace the students find a contact person that is available seven days a week. Behind the profile of Rachel Lovelace several members of the MIT-MUT team acted as game masters.

The everyday support from Rachel was also necessary because the implementation of the MIT-MUT concept varied from teacher to teacher and school to school. During the testing phase each class had a different timeframe where the students could work on their projects. Also some groups worked independently and used their free time for MIT-MUT, others played in class with the assistance of their teachers.

4.1 The challenge tasks

Each of the five phases reflects a certain work process of an IT company and is titled with a competence oriented motto:

- Phase 1 – START UP: The students form teams and found small start-up companies. Every member takes up a different role, such as manager, head of communications or graphic designer.
- Phase 2 – BE CREATIVE: The teams get the task to find an idea for a mobile app. The only requirement is that the target group of the app has to be youths. Within the team they have to agree on an idea and fill out a first app concept.
- Phase 3 – CREATE: The students create a paper prototype which shows the central features of their app and document the prototype in form of a video.
- Phase 4 – PRESENT: The teams produce short videos where they present themselves as a company and promote their app.
- Phase 5 – ACHIEVE: In the last phase the girls have the opportunity to vote for their favourite team. The team with the most votes receives the “peer award”. A jury with MIT-MUT project team members chooses the first, second and third place of the MIT-MUT challenge.

The product of every phase has to be uploaded to the Se³N and is commented by Rachel for providing personal feedback. Also all other members in the network are invited to like or comment the girl's works

Although the main theme of the challenge, the app development, is IT-related we did not focus on highly technical or software related aspects. Instead the challenge tasks leave large room for creativity and illustrate different work areas within an IT company.

4.2 Structure

In order to provide a social setting, the Se³N contains several groups. For instance, every phase of the challenge is presented in its own group. Likewise, for the MIT-MUT experts and also the download materials own groups were created. For internal communication each team/company also has its own group in Yammer. While the other groups are public within the Se³N, the girls can choose whether they want to make their communication within the company groups available for the whole network, only Rachel or only for the team members. The need for this privacy was expressed by some girls during the implementation phase, so the game masters changed the rules accordingly. Beside the specified groups on the Se³N there was also a so called *central network* – a message board for all members that can be used for general postings and news.

4.3 Gamification features

A social media network like Yammer offers a lot of opportunities to integrate gamification features with the goal to motivate and reward the students during the challenge. The well-known “like button” enables participants to express favour for a contribution on the platform. With an option called “praise”, every member can praise someone on the network with an appropriate symbol and a message. Beyond these Yammer related features a gamification system with certain achievements for the MIT-MUT challenge was developed. Achievements are represented as badges with a certain symbol and title and are strongly related to the competences the girls showed when fulfilling the different tasks of the challenge. Also the overall activity and contribution in the social network was rewarded.

4.4 Minigames

Beside the main challenge tasks four different minigames can be played. These minigames were especially developed for MIT-MUT and are settled within the preferred genres from the target group, according to the initial survey of the project. There is a tower defense game called “Bit Buster”, “Brain Twister”, a logic game, “Paper Plane Dash”, a 2D platformer and a matching game called “Match Me If You Can”. The reasons for including these minigames in MIT-MUT are diverse. They can function as a starting point for conversations about certain topics, such as work-life balance, IT-security or physics. Furthermore, they should also be fun and have a competitive edge with the integration of a highscore list. Above all, we want to highlight to the girls that the competences they have exhibited when playing the minigames are also necessary within the ICT sector or as entrepreneurs, like problem solving, logical and strategic thinking and planning.

5. Output and winning teams

At the end of the first MIT-MUT challenge and a jury meeting five winning teams were chosen. The selection was based on criteria like creativity, originality and realization. The initial plan was to reward only the winning team with certain prizes. To honour their efforts, we additionally chose to reward every girl who participated in the MIT-MUT challenge with a small thank-you gift. As prizes technical gadgets like mobile Bluetooth speakers or external battery packs for smartphones were given to the winning teams.

The first place was awarded to the teams “EFA” and “SABJ”. Their contributions got rated equally and therefore we decided that they both earn the first place. The app idea from EFA was to connect two or more smartphones to synchronize their sound output so that the sound volume increases and the

smartphones could be used as stereo speakers. SABJ created an app called “Timeflight” which has a function for the delayed sending of messages. “Dress4You” earned the second place for a convenient fashion app. The third place went to the app “CROWD”, which combines all popular social media networks in one app. The Peer-Award, selected by the students via voting, went to the team “JALM” with their app “PowerBeat” that has the goal to provide free and legal music without requiring an internet connection on smartphones.

6. Evaluation process and findings

65 girls participated within 17 teams in the MIT-MUT challenge. Each team had between two and six team members. The majority of the participating girls (78%) completed the challenge at least to phase four. The fifth phase – the voting – was only completed by 26%.

The logged activity data provide some indication about the student’s involvement in the Se³N. 12 girls never wrote a comment during the duration of the 7-week long challenge. Also 12 girls – 10 of them from one particular school – contributed to the network with twenty or more comments. Five of these 12 girls even wrote more than 50 comments. While “likes” were given out on a regular basis, only 11 girls put the “praise” function to use.

To gain insights into the actual impact, both qualitative and quantitative evaluations were conducted.

For the quantitative approach the students got an online questionnaire at the beginning and at the end of the challenge.

44 of the participating students (68%) filled out the end-questionnaire. Their answers give insights of the acceptance and appreciation of the faced challenges during the game. Looking at the results, students liked most to generate ideas for the app (M= 1.39; SD = .655). Second most they liked to find a name for their company (M= 1.55; SD = .730) and to create a Logo for their company (M= 1.55; SD = .791), followed closely by the paper-prototyping activities (M= 1.59; SD = .844) and the team work in the group (M= 1.59; SD = 1.148). Several further activities the students still liked much, e.g. playing different roles in the company (M= 1.91; SD = 1.087), playing the mini games (M= 1.93; SD = 1.385), the production of the presentation videos (M= 2.00; SD = 1.360) and the information in the Se³N (M= 2.07; SD = .828). The students rated the timeline of the game (M= 2.19; SD = 1.180) and the communication within the Se³N slightly negatively (M= 2.32; SD = 1.290). However, some students also rated these aspects positively. Looking at these results, one can see that students particularly appreciated the activities which gave them the opportunity to express their ideas and to be creative while they least liked organizational activities and implementation matters. Students were generally enjoying the game and therefore most of them (30) also liked to encourage other female students in their age to play the game, 10 were uncertain about that, and 4 would not recommend the game.

36 students (55%) filled out both the start- and the end-questionnaire. This data was considered in the impact measuring. Through suitable multivariate analysis methods, the impact survey gains insights in the pre-post-effects of MIT-MUT. An essential outcome from a pedagogical point of view is that the self-concept “talent” increased (T=2.266; p<.05). This self-concept can be seen as a key for career choices in the field of ICT and is distinctly exposed by stereotype influences. Beyond that the participation in MIT-MUT had a significant influence on the girl’s knowledgeability regarding IT professions. Almost a third of the students claimed that the interest for a career pathway towards ICT increased (T=2.668; p<.05). Part of the evaluation focussed on the self-assessment of competences. The results show that presentation skills improved significantly (T=2.194; p<.05). Filming a presentation video and the appearance as a company can be seen as a crucial part for this outcome. Concerning creativity, the effects are more complex. While especially students with a low self-concept

claimed that their creativity improved, students with a high self-concept had the feeling that they could not make enough use of their creativity during the challenge ($F=5.256$; $p<.05$).

The qualitative approach grants more detailed insights into the girl's experiences with the game. After the seven-week long test phase was finished the girls were questioned about MIT-MUT in eight group discussions. Also, in-depth interviews were conducted with the participating teachers.

The results of the qualitative evaluation show that both the students and the teachers rated the project MIT-MUT positively. They especially appreciated that the game fosters teamwork, independence, organisational skills and presentation capabilities. Although from the girl's perspective MIT-MUT was very time consuming in their leisure time, they were motivated to participate in the challenge until the end. Motivational factors were in particular the chance of winning and the feeling that they were part of a special project. They also had fun with the various tasks presented during the challenge. The involvement of the character Rachel Lovelace was successful. The girls appreciated her as a steady contact person for help and advice and praised her appearance in the video messages. While her feedback to the girl's contributions was also valued and described as a motivational factor, there was also the wish for more critical or honest feedback from Rachel. Another improvement proposal from the students was that the rating of the team's contributions should be bound to a scoring system where, for instance, an on-time contribution is rewarded with points. Another potential for improvement lies in the overall clarity of the information in the Se³N and a reduction of the number of email notifications. Despite initial concerns the time required from the teachers was relatively low and they could easily integrate the project in their lessons. The teachers primarily supported the girls with the implementation of the paper prototype and the video presentation. They also made sure that the tasks were fulfilled within the predetermined time window. Suggestions for improvement from the teachers were to enhance the integration of the role model videos and profiles with a related quiz and to provide more advance information regarding the technical requirements.

While the girls appreciated the fact that the social network was for girls only, they also saw the need for action regarding the boys in class. A separate social network with a program especially for boys was one of the suggestions. Also the teachers wished to have a similar program for boys which could be taught parallel. The following selected quotes from the qualitative interviews with the girls, translated from German by the authors, speak for themselves:

„I really liked the project. I also liked working in groups and simply the feeling that we develop an app was cool, and that we could be creative, I really liked that.”

„It is something really special. For instance, in another school girls sit ordinary in class and we were allowed to do this project.”

„For us it was cool to collect experiences. Rachel also always gave beautiful positive feedback and that motivated us of course as well.”

„It is simply nice to get praise for the work you have achieved.”

7. Conclusion

The qualitative and quantitative analysis show that the MIT-MUT game is very well-suited to encourage girls aged twelve to fourteen to engage in ICT and entrepreneurship. Furthermore, the game promotes independent work and learning, team-working abilities and skills regarding organisation and presentation. The results of the evaluations and the learnings from the testing phase are a valuable basis for further development and improvement of the MIT-MUT project. Each of the participating teachers would appreciate the integration of MIT-MUT in the regular curriculum and also two thirds of the students would further recommend MIT-MUT.

8. Future prospects

Based on the findings from the testing phase of the alpha-version of the MIT-MUT game, a beta-version is currently in development. Some of the improvements are for instance a scoring system for the contributions, a re-structuring of the information provided in the Se³N, a role model quiz and a concept for a version of MIT-MUT which includes boys with a program placed within a separate social media network.

As in July 2016 the project term of MIT-MUT comes to an end, strategies for further financing and a continuing and more extensive implementation in schools throughout Austria and beyond are in development.

Acknowledgements

Acknowledgments will be placed here after the review process.

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