Agile for agile - new ideas for the transformation of student projects

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Abstract: The IT working practice is becoming more agile. To prepare students for the agile work-place we decided to transfer our well established student projects with external customers towards an agile approach. This paper describes the iterative improvement process within an IT Bachelor degree course. As we were not sure how to teach an agile framework in an university setting, we chose an open approach, based on action research. Action research includes the agile principles of iteration, inspect and adapt. Our transformation process was not only iterative but also involved all relevant stakeholders. In the described process students, lecturers, external company members and agile experts participated equally. This led to a collection of new ideas on how to design agile projects in an university context. They were partly implemented and evaluated. We report on three iterations and provide the lessons learned in a condensed Scrum-Guide for student projects.

Keywords: Scrum, teaching agile, student projects, capstone projects, gender aspects in teaching

1   Introduction

The IT working practice is changing towards agility. According to the last annual agile report [Ver17] 94% of companies worldwide are employing some kind of agile method. Within software development this means to follow an iterative approach with a focus on collaboration and communication. The aim of an agile approach is to improve efficiency and effectiveness in teams delivering software. As agile methods start to dominate the IT practice, teaching agile methods is a necessity for universities claiming to train for prac-tical careers.

The curriculum of the IT program Computer Science and Business Administration at HTW Berlin (University of Applied Sciences) already contains a rich set of different lecture for-mats that combine acquired theory with practical experience. The program established in 2009 is a women-only Bachelor degree course. For such a program (see [SFK16] for more information) the particular focus on practical training is a means to face preconceptions based on stereotypes and to empower the students for the future workplace [Dev92, Bli05].

Core of the practical training are the two industry projects, situated in the third and fifth semester of the curriculum. Here the students work in overlapping teams at a real task. The tasks are provided by companies, which accompany the development throw-out the whole semester. So far the projects have followed a classic project management approach. To

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empower the students for the future workplace we decided to adapt the projects towards an agile method.

Such a transformation means to introduce short implementation cycles, to use a set of new organizational instruments and to staff new roles. It also means to follow the agile principles and values, cf. [ScSu16]. For the latter it is required to regularly reflect on the used practices and the working atmosphere and to address and resolve conflicts early in the process.

As we were especially unsure about teaching the agile principles and values, and we wished to change our teaching, as we progressively understood better what to do, we chose action research as the most suitable approach. Action research is an iterative approach based on repetitive cycles, each of which has three main stages: Plan, Act, Reflect/ Evaluate. The close relation to the agile approach and the combination of reflection and action made action research the obvious choice for the overarching methodology.

After a literature review, we describe the starting situation and the research methodology. We consider the 2016/17 project iteration as the first action research cycle. An emphasis is put on the transformation process, incorporating several open rounds with different stakeholders. The results were used to set up the second action research cycle (semester 2017/18) and with only small changes the third iteration (semester 2018/19). The findings focus on the implementation of agile management and collaboration practices, such as the assignment of roles and tasks and the design of the retrospectives. The gained knowledge is provided in a condensed Scrum guide for student projects.

2   Related Literature

The success of the agile working methods has found its echo in the software development courses of universities worldwide. In the university context, longer projects (often called capstone projects) seem to be an ideal means to provide a framework to combine hands-on experience with teamwork- and project management experiences and for teaching agile working methods [Mah12]. In order to raise the motivation of the students it is more or less common sense to provide real tasks and to involve industry partners as customers. Differences between the project formats are based on the design of the specific course and its focus. The design depends on the restrictions set by the curriculum, i.e. maturity level of the students, credits, duration and available resources. The focus depends on the chosen set of skills. Agility in practice needs and combines skills from three main categories: engineering, management or collaboration and agile values [KrMe13].

Chatley and Field [ChFi17] try to simulate industrial conditions. They work with real tasks from different external customers and focus on small iterations. Every two weeks, they introduce a marked checkpoint where the students have to demonstrate a running end-to-end-feature. The use of an agile method, like Extreme Programming, Scrum or Kanban is suggested.

Mahnic describes projects, in which the students work in parallel on a quasi-real task. The students are advised to use the Scrum framework, cf. [Mah12]. The collaboration practices

are supervised by the instructor, who meets the team in regular review meetings and retrospectives, the role of the Product Owner (PO) or Scrum Master (SM).

Kropp et al. [KMB16] put emphasis on teaching collaborative practices and agile values. The task tackled within the student projects are provided by students, faculty or external customers. Correspondingly a member of the according group plays the PO, while the other roles are taken over by students. They rely on coaches to create an appropriate ecosystem and to encourage and facilitate collaboration practices like release planning, retrospectives, daily stand-ups, pair-programming or code review.

Another approach with real clients and tasks is proposed in [Viletal17]. Teams of four or five students were randomly selected. The paper addresses the application of Scrum and discusses the value of suitable tool-support. Villavicencio et al. report problems caused by the unavailability of the client and a team conflict, which arose as one of the team members wanted to decide about the task assignment within the team. This led to the end of the project and the exclusion of the conflicting member from the project lecture.

Anslow and Maurer [AnMa15] describe a project with real customers and a very close and time expensive coaching routine provided by the instructors. The latter was possible because only two teams had to be guided through the semester period. The teams had seven members each, one with graduates and one with undergraduates. The instructors acted as SM's. The external client played the PO. The instructors observed all meetings.

An approach very close in size and setting to the one introduced in this paper is [Paaetal18]. Paasivaara et al. describe a mandatory capstone project with different industrial clients and real tasks. It guides the students in the application of Scrum. A client representative works as PO. The SM is a SW-Engineering Master's student. The development team members are second-year undergraduate students. There was no explicit statement about the composition of the team, but from the numbers it could be concluded that each of the 14 teams consisted of eight to ten students. The advised agile working methods were introduced in different Scrum introductions, including a LEGO-simulation game and an extra workshop for SM's. For guidance and grading of the 14 teams individual time monitoring and the production of three documents were required (about the product vision, system design, and work practices). Beside these, the teams were advised to maintain a product backlog and arrange sprint reviews, retrospectives, planning events and a weekly stand-up meeting. Four experience exchange sessions were organized during the six-month period and coaches met the teams at least once per sprint and were otherwise available per email.

In [Paaetall18] it was investigated how the participating in a capstone project affected student attitudes. The evaluation results are mainly based on the quantitative evaluation. A questionnaire with 15 predefined statements was used. The statements describe relevant aspects needed to be developed by SW-engineers and the students were asked to rate their change after the course. The results were augmented by team interviews. Both measures referred to general software development issues and did not specifically address the agile values or the acceptance of agile principles. Still the results are very encouraging, as students reported an increased importance of collaboration and communication within the team. The projects also increased the students confidence and trust in their own skills. This is especially interesting because the projects have recently been moved from master's course into the second year of the BA-curriculum. The authors state that although almost

half of the students did not have working experience in software development, they "... learn a lot and they can do more than they and we teachers expected".

3   The Initial Situation

The project lecture is a mandatory course in the third and again in the fifth semester. This means every winter semester around 80 students are working at real tasks provided by 10 to 12 different external customers. These are companies or non-profit organizations, which accompany the project throughout the semester. The involvement of the company representatives varies from a minimum of three joint meetings and virtual support to weekly working sessions at the company. The supervision of the projects is shared between a team of three to four university teachers. They organize the acquisition of the clients, the team building and the initial project allocation, as well as the interim and the final presentation. Throughout the semester each lecturer supervises two to four projects and assumes responsibility for the grading.

Since the program began in 2009 we have continuously been trying to improve the setting. An example is the team composition. In the first years we had different projects for the different semester and experimented with various mechanisms of project assignment. For the fourth iteration in 2013 we changed to a lottery system, guaranteeing mixed teams between the semesters. A proportion of students with project experience has been found to relieve the pressure on the younger students. The lottery system also yields diversity with respect to ethnicity and grades.

3.1   Research design

The study starts with the projects conducted in winter 2016/17 and covers three cycles. The evaluation of the 2016/17 cohorts triggered the change towards an agile approach. As we wished to be able to progressively adapt our teaching, we chose action research [McN13] as the most suitable approach. Action research can be defined as "a purposeful, yet systematic and often collaborative inquiry, conducted by teachers and teacher-leaders for the intent of improving their practice and performance" [LlZe10] p.12. Action research is an iterative approach based on repetitive cycles, each of which has three main stages: plan, act, reflect/evaluate [McN13]. The first step requires identifying the problem in the learning process. Secondly, it involves doing research to analyse the problem and to find ways of improving the situation. It is also important to evaluate the changes in order to determine improvements in the learning process. Within the action research cycles we used qualitative evaluations based on surveys and the instrument of a retrospective to understand how the participants followed the agile approach including the internalization of the agile values and principles.

3.2   Instalment and evaluation of the first cycle

In winter semester 2016 we had 11 projects with initially 67 participants. Some teams, encouraged by their industrial partner, chose an agile working method. However this was not aligned with the project management instruments used in the projects (e.g. project lead

reporting to the supervisor, time recording, development of a project handbook), the tools proposed (e.g. Redmine as project management platform) or the accompanying project management lecture, where Prince2® was taught. At the end of the semester, 53 students passed and one failed, but 14 (21%) dropped out and decided to complete the course later.

At the end of the semester the course was evaluated using the common online template for lectures. We received 18 completed questionnaires (33%). Because of the different accompanying lecturers, we only evaluated the text blocks providing information about obstacles and improvement proposals. Dissatisfaction was expressed especially from the teams that had tried the agile working method. They claimed the missing appreciation for the chosen approach and the additional expenditure. Here the required project handbook (for the PM-lecture) was seen as an extra burden with (almost) no benefit for the actual project work. Two of the teams even used a different project management platform (Jira) and complained about the double load of maintaining two tools. However, some students following the classical approach also claimed that the artefacts to be produced for the PM-lecture (specifications, project plan with milestones, project handbook) were always created too late in the semester, so they were of no help for the projects.

4   Agile for agile - transfer process

The feedback and the experience from the semester are always evaluated during the annual closed meeting of the four professors associated with the program. Based on the feedback and the demand from the practice partners we decided to promote an agile procedure for the next cohort. The change towards agile was decided quickly. Still, as we were not sure about the implications of this decision, we wanted to incorporate the opinions and ideas of all stakeholders throughout the process.

As a first step we planned a full-day workshop with students, lecturers and recent company partners. In order to allow for an open discussion we also invited uninvolved agile coaches. Integrating some fervent supporters of the agile practice we hoped to come up with a solution that would go beyond the adaption of organizational rules, but allow for a change of the mind-set too.

The workshop took place in May 2017, with 10 participants: three students, three professors, three externals (one recent customer, two agile experts) and one scientific co-worker as organizer and moderator3 . The objective of the workshop was to find a setup for agile student projects that would bridge the gaps between the agile practice and the framework of the university setting. Two further iterations followed. In a second workshop the setting underwent a feasibility check. Here the imminent semester start forced a more pragmatic approach. In the third iteration, the revised settings were checked against the partner expectations. We communicated the revised procedure, including proposed tools, templates and role descriptions to two company participants. In telephone conversations we met with a positive reception.

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[3] The whole process was supported by the second author, who is the project management lecturer and is working on her PhD-thesis on factors promoting self-organized teams.

In the workshops we tackled the following topics: Team composition and role assignment (0) , Process organization and use of resources (0) and Grading (0). These three topics were chosen as they address important pillars of agile practice: the cross-organisational team, the implementation of the Scrum flow including the collaboration practices and the motivation. Furthermore these topics contain contradictions in their realization at university and in practice, which have to be resolved where possible.

4.1   Agile Setting I - Results for Winter Semester 2017/2018

Planning the workshop, we aimed at providing a learning environment that would focus on teaching the agile methods. During the introductory discussion of the objective, this vision shifted slightly. The agile approach should be a means to an end, i.e. the objective would still be to enable a successful project with a real customer. Based on our experience, such a success promotes the professional self-image of the students more than any other lecture format. A successful project experience is to a large extent based on good collaboration and a fair work balance between the team members. Both are facilitated if the team lives the agile values.

In contrast to other implementations, e.g. [ChFi17] we decided to determine the agile approach to be used, namely Scrum. Within this framework we decided to emphasize on the collaboration and management practices that support the internalization of the agile values.

4.2   Team composition and role assignment

Ideally, agile teams work cross-functionally. In practice this implies that all skills for the implementation of the product exist within the team, which consists of members with different level of experience and complementary expertise. In university context this is probably different. Here the students have (more or less) the same level of experience and not yet so diverging expertise.

In the first workshop, it was thought that it would be good if the participants were assigned to the projects on the basis of their skills and learning interests. The use of different skill matrices was discussed: one per project and one per student. Still, the necessary matchmaking procedure was regarded to be too expensive with respect to time and preparation effort. It was therefore agreed to retain the approved lottery mode. This procedure results in quite diverse teams with respect to age, ethnicity and demeanour and provides at least some balance with respect to seniority - guaranteeing a team-mix across the semester.

Despite the role assignment rules in other university approaches, cf. [Mah12, KMB16, AnMa15, Paaetal18] we thought, it would be desirable if all core Scrum roles (SM, PO, Development Team) were taken up by team members. All other participants are stakeholders. This way the students get the chance to gain experience with the whole set of agile roles.

Another difference results from the mono-educative setting. In mixed teams, the role and task assignment is influenced by gender specific attitudes or preconceived ideas. A study from 1977 [Kan77] already showed that minority group members face additional stresses due to underrepresentation. A more recent study by Lloyd and Szymakowski supports the

notion that: "female students who have the opportunity to work in gender parity or higher small groups exhibit engaged behaviors", [LlSz17]. In a mixed setting women often show a less resolute attitude and accept less glamorous tasks, e.g. the documentation, or the test cf. [Seretal2016]. A beneficial side effect of the women only setting is, that every role and every task has to be done by women, so there is more chance that role and task assignment follows skills and interests and is less influenced by gender specific attitudes or stereotypes.

The teams do the role assignment themselves. To support the decision it was agreed to organize a Scrum- and team-building workshop (LEGO-simulation) at the start of the semester. During two full days the students get a Scrum-intro and at the same time grow together as a team. At the end of the workshop they are asked to set up team rules and to assign the Scrum roles of SM and PO.

4.3   Process organization and use of resources

In good agile practice a team is involved in one project only and the SM protects the team against distraction. At university the project is just one of many lectures during a semester. To pool the resources ant the time available it was decided to link the project with to other lecture formats, i.e. project- and conflict management.

Project lecture: The project lecture (10 credits) itself would be used to install the Scrum flow, i.e. to provide time and space for the teams to meet for planning, stand-ups, review and retrospective. The teams were advised to work with a sprint length of three weeks. Each sprint should start with a planning, have at least one 'stand-up' per week (better two) and end with review and retrospective. The lecturer supervising a specific project would join the review meeting and would be there to answer questions and provide support on request. The actual project work is organized by the team. To compensate for the distributed workspace and time, the use of a virtual scrum board and a common communication channel (like slack) were advised. The choice of a specific tool was left to the teams. A default provided on the faculty server was Trac with the plugin Agile for Scrum.

Project management lecture: For the accompanying project management lecture (5 credits together with conflict management) it was quickly agreed that it would be used to learn concrete Scrum techniques, such as writing and refining user stories, capturing a project vision, characterizing a minimum viable product or sprint planning. All techniques would be taught using the examples from the projects.

Conflict management lecture: If a group of people works together there are conflicts. To facilitate the problem solving process, we engaged an experienced coach and mediator as lecturer. At the beginning of the semester he gives a general introduction about effective teamwork and conflict management. Then the teams have one obligatory team session and are encouraged to request his help whenever a conflict arises. This method was effective for teams that used it. But often the teams asked for support at a very late stage. Then the teamwork had already suffered or team members felt like leaving the team (which would result in a repeat semester). Furthermore the procedure did not cope with the phenomena of concurrence seeking [Jan82] or the related groupthink [JoJo09]. These occur when members of a group emphasize agreement and inhibit discussion to avoid any disagreement or argument. Underlying such behaviour is the desire to preserve the harmonious

atmosphere of the group on which each member has become dependent for coping with the stresses of external crises.

The idea generated in the first workshop was the use of the retrospective for the conflict management lecture (or vice versa). We agreed to send the coach into the retro's. He would not be obliged to take action if the meeting was run properly, but he could intervene as soon as he felt any discordant elements. He could also check if the team atmosphere seemed too harmonious. We hoped this change would have the benefit that more of the existing conflicts would be addressed before the teamwork suffered or students dropped out.

Figure 1 shows the process-organization and the use of the lecture formats throughout the semester.
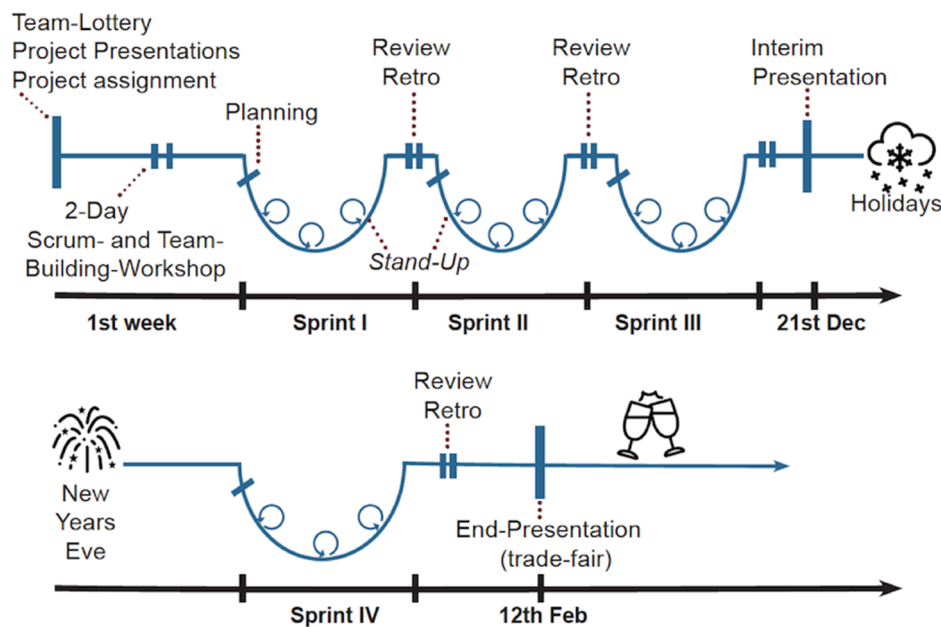

Fig. 1: Scrum flow throughout the semester

4.4   Grading

The grading is an obligatory part of a university lecture and has no direct counterpart in practice. Grading only sets an extrinsic motivation for the delivery of a certain performance. Generally the basis of true motivation is reduced to three factors: autonomy (self-determination), meaningfulness and mastery [Pin11]. People have the desire to determine the direction; they feel better when they have a certain independence and scope of action. They want to contribute to something great, be useful and receive recognition. People want meaning in their daily actions and they strive to master what they do.

Within the student projects at university, motivation is influenced by different factors. A supporting factor is working on a real task. The prospect of having your own solution used,

contributes to the meaningfulness. Incentives also arise through the participation of companies. The students strive to present themselves as well as possible to employers. Finally, the grading can motivate the students, if they focus on "mastery". A good grade is also a sign of recognition.

During the first workshop, it was agreed that for a grading incorporating the agile values a personal oral conversation would be optimal. In the lecturer workshop, the pragmatic view again prevailed. Individual conversations would be too expensive. It was decided to stay with the approved assessment, but adapt the process part. The evaluation would reward - the two presentations (10% + 20%), the achieved results, listed in a short project report (50%), the website (5%) and the agile way of working (15%). For the evaluation of the agile approach, we relied on to Scrum artefacts, such as backlog and sprint board. Every team was advised to maintain an electronic scrum board. With access to that board, the supervising lecturer could gain insights into the proper use of the agile approach.

The grading for the project management lecture is independent of the project. Instead of a project handbook, a normal exam at the end of semester is used. This supports the agile working, as fewer artefacts have to be produced.

For the conflict management there will only be a pass or a fail. The undifferentiated assessment in this subject is helpful, as the students may deny conflicts if they fear being given a poorer grade.

5   Instalment second and third cycle

The new procedure was introduced in October 2017 and continued in October 2018. In the second iteration we initially had 70 students and 12 projects. All projects ran between three to four iterations and implemented the regular meetings: planning, review and retrospective as well as one to two weekly's. At the end of the semester, 63 students got a grade and two failed, whereas 7 (10%) dropped out and decided to retake the course later. In the third iteration starting in October 2018 we initially had 83 students. In order to better level the workload, we adapted the team size and only staffed 10 projects. 73 students got a grade, nobody failed but 10 students (12%) decided to postpone the project.

5.1   Evaluating the agile

A first indication of the success is the reduced drop out rate. Comparing to the first non-agile cycle it was reduced from 21% to around 10%. It seems likely that this positive development results from the improved team atmosphere and the adoption of the agile values. Still, the numbers are not representative because only three cycles were compared. Further observation and evaluation is necessary to confirm this trend.

To appraise the change, we decided to refer to qualitative evaluation and feedback measures. For that we enhanced the classical evaluation survey by three qualitative questions addressing the change towards agile. At the end of the first agile cycle in February 2018, we asked: What had changed through the new approach?, What did you like/dislike about the agile working method? and What advise would you give the teams for the next

iteration? A second feedback input came from the lecturers. At the end of the semester we met for a project retrospective. Applying the starfish method4 all involved lectures reflected on the passed project lecture and discussed possible improvements.

5.2   Evaluation results

Survey: In order to raise the response rate the questionnaire was distributed and collected per hard copy at the end presentation event of the project lecture. For the evaluation we can refer to 55 completed questionnaires (87%), 31 from 5th semester students and 22 from 3rd semester students (2 students did not specify their semester). The feedback of the survey is subsumed in the following. The main feedback for the projects was very good. The change towards Scrum was appreciated. Here are some (translated) quotes from the survey: "Scrum is brilliant, keep going", "It was good to adapt to problems", "personally good experience, learned a lot, team strengthened", "working with Scrum is very up to date, good reputation at the companies", "with Scrum our project work was structured and everyone knew what to do", "good and suitable - no time recording anymore".

Still, we also noticed that some things were not yet working well. Most problems arose through a poor workload distribution. The reasons for this originated from a problematic or insufficient role comprehension. A typical comment is: "Scrum means for me much extra work, Scrum Master had almost no tasks, where others had to do night shifts - they should be involved in development".

Apart from the workload, the insufficient knowledge about agile working techniques was problematic: "Scrum intro at the beginning was not enough for comprehension" or "It would be good, if there was extra training for PO and SM" illustrate the feedback provided. In some teams, the agile approach did not unfold its advantages at all, as shown by the following quotes "bad: less work more meetings (time)" or "waste of time - instead you can develop something". Although we reduced the amount of documentation necessary, we still got the remark: "partly too much focus on the documentation of the project".

Lecturer feedback: Also the discussion between the lecturers revealed some inconsistencies. Every lecturer supervised between two to four projects. In the project retrospective it was revealed that even the four supervisors had no clear and consistent comprehension of their role. The role description as "stakeholder" was very vague and was interpreted differently. One indication for this finding was different contact persons in the teams: some lecturers communicated via the Product Owner others via the Scrum Master. Another indication was the different behaviour within a review meeting, which ranged from pure observation to active moderation. As also the structure and the time box of the review meeting were not clear, it was sometimes misused as a consultation session. During the common assessment of the projects we also noticed that the assessed artefacts, namely the Scrum boards looked very different, revealing a misunderstanding of the of the agile process, e.g. member assignments were not on task-level but on user story level.

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4 The starfish method is an information gathering activity used within Scrum retrospectives to help the team members to reflect on the last sprint and to come up with improvements for the future work (one example can be found here: http://www.funretrospectives.com/starfish/).

An idea, which worked very well, was the retrospective guided by the conflict manager. He reported on several meetings where his active intervention brought up hidden conflicts, which could be solved much earlier than before. Another benefit came in through the role assignment. It was very helpful to have a PO at student side. In other approaches, see [AnMa15, Paaetal18, Viletal17] the PO is taken over by the external client. If problems with the external stakeholder occur, the team process is at risk, cf. [AnMa15, Viletal17]. Having a student playing the PO leads to more process skills within the team: the PO is responsible for the preparation of the user stories, which have to be written and refined by the team. It also channels the communication towards the customer and provides flexibility if the contact to the customer gets lost.

5.3   Agile Setting II - Results for Winter Semester 2018/2019

The results of the evaluations of the first agile cycle were very encouraging. It was clear that we would stay with the agile approach and try to foster it in the future. For the second cycle (winter semester 2018/19) we again met with different stakeholders and adapted the setting slightly. In order to scope with the workload, we enlarged the team size. To reduce the documentation requirements we agreed to forgo the project report listing the results. Instead we required a screen shot of the Scrum board after each review. These boards reveal the participation of all team members as they show the people assigned to the tasks in 'done'. If the agile process is used, these artefacts can be provided with almost no extra effort. The assessment of these artefacts will also enforce the proper use of other agile techniques, such as writing or estimating user stories. As default tool, we advised a virtual board using Trello. All the rules and best practices have to be at hand in the teams. We decided to summarize the Scrum knowledge and the adopted wording in our own Scrum Guide. We developed eight posters illustrating the Scrum flow, the responsibilities of the different roles, the sequence of the advised meetings, and the use of the Scrum board. The Scrum Guide will help to reduce uncertainties with the working methods and clarify the responsibilities of all team members. For the posters, e.g. Figure 2, we decided to use strict technical stereotypical male design in stereotypical pink to deconstruct any gender assumption [ERI12].
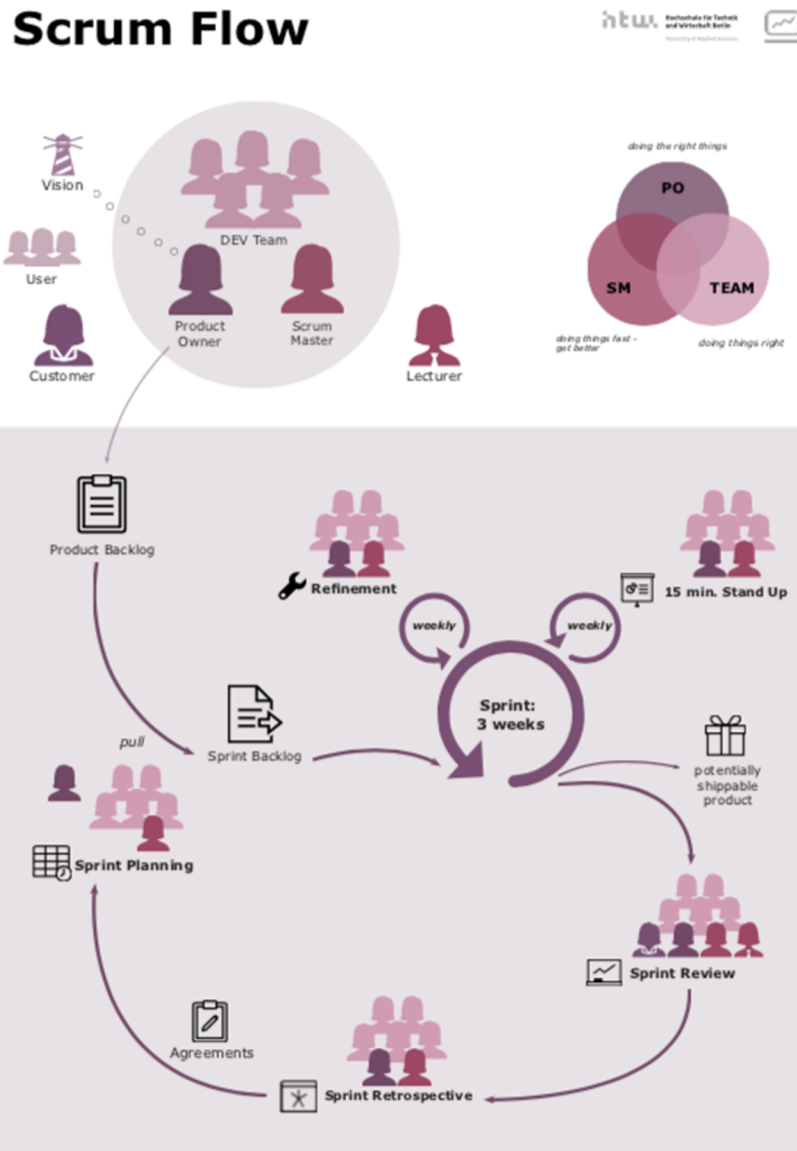
Fig. 2: Project Scrum-Guide 1/8

6   Conclusion

The application of agile methods in student projects is a goal of many student programs. The projects in the women-only program are core of the goal to foster the graduation of women as confident computer scientists. The transformation of the projects towards agile should maintain the benefits of the well established lecture but combine them with the

knowledge of the new methods and the possibility to experience all roles. It should furthermore focus on the internalisation of the agile values to improve the collaboration. For the transformation we chose Action research - an iterative and incremental process supporting the stages: plan, act, reflect/evaluate. We involved all stakeholders, i.e students, external customers, lecturers and agile coaches alike. Applying such an "agile" approach we hoped to find an optimal teaching format, to get across the new agile techniques but also provide more students with a successful project experience. The result is a SCRUM adaption for student projects, which exploits the resources and restrictions given through the university context as close to best agile practice as possible. The presented approach supports the entire Scrum flow with planning, stand-ups, review and retrospective. Special features are the assignment of PO and SM with students and the guided retrospective. A first measurable result is the reduced drop out and the positive feedback from the students. In the future we will also conduct and evaluate qualitative interviews to provide more insights on the perceived project experience and the internalisation of agile values.

Literature

[AnMa15]   Craig Anslow and Frank Maurer. 2015. An Experience Report at Teaching a Group Based Agile Software Development Project Course. In Proceedings of the 46th ACM Technical Symposium on Computer Science Education. 500–505.

[Bli05]   Jacob Clark Blickenstaff. 2005. Women and science careers: leaky pipeline or gender filter? Gender and Education 17, 4, 369–386.

[ChFi17]   Robert Chatley and Tony Field. 2017. Lean Learning - Applying Lean Techniques to Improve Software Engineering Education. In 2017 IEEE/ACM 39th International Conference on Software Engineering: Software Engineering Education and Training Track (ICSE-SEET). IEEE, Buenos Aires, Argentina, 117–126.

[Dev92]   Fiona Devine. 1992. Gender Segregation in the Engineering and Science Professions: A Case of Continuity and Change. Work, Employment and Society, Vol 6, 4, 557–575.

[ERI12]   Karin Ehrnberger, Minna Räsänen, and Sara Ilstedt. 2012. Visualising Gender Norms in Design: Meet the Mega Hurricane Mixer and the Drill Dolphia. International Journal of Design; Vol 6, 3, 85-94.

[Jan82]   Irving Lester Janis. 1982. Groupthink: Psychological studies of policy decisions and fiascoes. Houghton-Mifflin. Boston.

[JoJo09]   David Johnson and Roger Johnson. 2009. Energizing Learning: The Instructional Power of Conflict. Vol 38, 1, 37–51.

[KMB16]   Martin Kropp, Andreas Meier, and Robert Biddle. 2016. Teaching Agile Collaboration Skills in the Classroom. In Proceedings of the 29th International Conference on Software Engineering Education and Trainng (CSEET). IEEE, Dallas, TX, USA, 118–127.

[KrMa13]	Martin Kropp and Andreas Meier. 2013. Teaching agile software development at university level: Values, management, and craftsmanship. In Proceedings of the 26th International Conference on Software Engineering Education and Training (CSEE&T). IEEE, San Francisco, CA, USA, 179–188.
[LlZe10]	Douglas Llewellyn and Emily van Zee. 2010. Action research: Expanding the role of classroom teachers to inquirers and researchers. Vol 34, 12–15.
[LlSz17]	Natalie Anne Lloyd and Jolanta Szymakowski. 2017. Student experiences in first-year engineering classrooms - exploring issues of gender in an Australian programme. Australasian Journal of Engineering Education Vol 22, 1, 23–31.
[Mah12]	Viljan Mahnic. 2012. A Capstone Course on Agile Software Development Using Scrum. IEEE Transactions on Education Vol 55, 1, 99–106.
[McN13]	Jean McNiff. 2013. Action research: Principles and practice (3rd edition).
[Paaetal18]	Maria Paasivaara, Dragoş Vodă, Ville T. Heikkilä, Jari Vanhanen, and Casper Lassenius. 2018. How does participating in a capstone project with industrial customers affect student attitudes? In Proceedings of the 40th International Conference on Software Engineering: Software Engineering Education and Training (ICSE-SEET '18). ACM, New York, NY, USA, 49-57.
[Pin11]	Dan Pink. 2011. Drive: The Surprising Truth About What Motivates Us. Riverhead Books.
[ScSu16]	Ken Schwaber and Jeff Sutherland. 2016. The Scrum Guide. Scrum.Org, ScrumInc.
[Seretal16]	Caroll Seron, Susan S. Silbey, Erin Cech, und Brian Rubineau, 2016. Persistence Is Cultural: Professional Socialization and the Reproduction of Sex Segregation, Work and Occupations, Vol 43, 2, 178–214.
[SFK16]	Juliane Siegeris and Jörn Freiheit and Dagmar Krefting. 2016. The Womens Bachelor Programme "Computer Science and Business Administration" and its Consistent Orientation to Practical Training. In: Procedia - Social and Behavioral Sciences, 509–514.
[Ver17]	VersionOne. 2017. The 11th Annual State of Agile Report. VersionOne.
[Viletal17]	Mónica Villavicencio, Erika Narvaez, Edgar Izquierdo, and Jhonny Pincay. 2017. Learning scrum by doing real-life projects. In Proceedings of the Global Engineering Education Conference, EDUCON 2017, Athens, Greece, April 25-28. 1450-1456.