Applying SCRUM in a Physics II Undergraduate Course: Effect on Student Progression and Soft Skills Development

Manolis Lourakis[1,3], Konstantinos Petridis[2,3]

[1] PhD Candidate
[2] Associate professor

[3] Hellenic Mediterranean University, Department of Electronic Engineering, Romanou 3, Chania, Greece, 73100
{lourakismanolis, c.petridischania}@gmail.com

Abstract. *The everchanging higher education environment, especially after the impact of COVID-19, dictates the need of innovative, engaging, and efficient teaching methods along with promoting soft skills among the students. Scrum offers a framework for effective teamwork and it has been previously applied in higher education for enhancing collaborative learning and the development of skills. This paper will describe how Scrum was applied to a Physics II undergraduate course during the spring semester 2021, where classes were given online due to covid-19 imposed restrictions. The focus of this experiment was twofold. Firstly, we aimed at investigating the feasibility of Scrum under remote teaching conditions. Secondly, we observed the students' progress with the learning objectives of the course, along with the advancement soft skills among the students participating in the experiment. We conclude our presentation with feedback collected both from the teachers and the students involved in the experiment.*

Keywords. Scrum, active learning, collaborative learning, soft skills, remote teaching, group project

1   Introduction

As the Future of Jobs report 2020 states, the relative importance of critical thinking and analysis along with self-management and working with people skill groups, are of increasing importance among companies worldwide [6]. Among the plethora of skill groups described in the report, the self-management skill group emerges as the most wanted in industry, since it encompasses skills such as active learning, resilience, stress tolerance and flexibility. Research has already stated the importance of these skills for career success [7], while most recent investigation identifies the soft skills gap between the Higher Education-HE and Employability [8]. Education 4.0 addresses these skills gaps so the future work force can be able to respond on the needs of the 4th industrial revolution. [9]. The nine trends of Education 4.0 dictate among other, that must be a shift to the major responsibilities from the instructor to the learners, and that learning can take place anytime anywhere through e-Learning tools.

University graduate students should be ready to function in a specific and highly competitive working environment. They would be creative and critical thinkers, be able to negotiate and communicate their work, be team players, they should have substantial management skills and be able to facilitate learning in groups and communities. However, University graduates require far more personal skills, complementing their discipline expertise, than is recognized in today's mainstream education [10]. Most of the soft skills are not considered at all in the present curricula, and disciplines [11]. This does not mean the replacement of disciplinary courses with soft skills courses but the integration of new way of teaching that will cultivate the aforementioned soft skills through the hard skills courses. New innovative pedagogies and learning frameworks must be adapted by the Universities to facilitate the capacity of 'ideal' graduates to integrate across disciplines and skills (hard and soft skills). All the above facts gave inspiration for the implementation of the Agile tool of Scrum, in remote teaching conditions, so to investigate the overall benefits to the students from this different pedagogy concept. In this study, the application of Scrum within the framework of the Physics II module incorporates many components of soft skills development (for both of students and trainers), (a) action research as a research method; (b) facilitation concepts & techniques; (c) process management, planning; (d) knowledge management; (e) communication skills; (f) team skills, team management, team building; (g) facilitating learning processes; and (k) process consultation and coaching skills.

Agile methodologies are proven to be effective in higher education as teaching/learning practices based on the best concepts and ideas from the field of software engineering and software development [11]. Especially the Scrum framework is proven to facilitate the level of engagement required in group projects even when applied in HE teaching and learning processes, mainly because it enables active learning and self-management [2-5][13]. In active learning concept, the learners are responsible for their own learning [14-18] and this practice is well served by the principles of the agile manifesto since it values student-driven inquiry and continuous improvement among other values [19]. On a parallel concept, Scrum as an agile framework, can cultivate soft skills among other hard disciplined knowledge, to the group that use it, as it will be shown in this paper. The main challenge of the Scrum

application was the remote teaching conditions during the semester due to covid-19 restrictions. Additional challenge imposed by the idea of applying Scrum, exactly as described in the updated in 2020, Definitive Scrum guide [20] by Ken Schwaber & Jeff Sutherland, a fact that was not evident in previous works on the subject [3-5]. The diversions from the Definitive Scrum Guide were as follows:

- Daily Scrum meetings didn't happen every working day.
- Not clear presentation of the construction of the Product Backlog.
- Sprint retrospect meetings were not held.
- Delivery of increments in between the Sprints and not in the Sprint Review.
- Unclear references to the Sprint Planning meeting.

For that, was imperative to us to prove that the Definitive Scrum guide can be applied as is in the HE Institutions without special training. Additional task was to introduce to the students the actual framework that they will most likely meet in their future working environment, since the electronic engineering sector involves project teamwork and software development. Besides the above-described goals, a soft skill enhancement of the students, was desired, through the insufflation of the core pillars values of scrum and adherence to the framework's roles and events.

2   Background and Motivation

2.1 Scrum framework pillars and values

Scrum framework encompasses both the objectives of active learning and engagement since it engages groups of people who collectively have all the skills and expertise to do the work and share or acquire such skills as needed [20]. Paramount importance have the three pillars and the five values, that must be embraced in parallel with the three roles, the five events and the three artifacts. First pillar is the transparency of the work that will lead to the second pillar of inspection which in turn will drive the third pillar of adaptation. The whole organization must adhere to the three pillars for the Scrum to be effective and successful. The five values must be embraced by the scrum team and these values are openness, respect, courage, focus and commitment.

2.2 The three roles

The scrum team consist of the Product Owner, the Scrum Master, and the Developers, which are the three roles of scrum.

Product Owner is the sole responsible for the outcome and he is the voice of the customer that sets the vision and the priorities for the product goal. Scrum Master is a leader who serves and oversees the application of scrum in all levels of the organization. His purpose is to facilitate the application of the framework and the continuous improvement of the developer's team. Developers as the last role, is the group of people that perform the work

towards the completion of the product. The members are cross-functional and possess all the skills needed to do the work. They are self-managed with no actual leader, and they decide collectively on every aspect of the work to be done, following the iterative manner of the five events.

2.3 Scrum events

The project starts with the event of Sprint planning meeting where the scrum team under the direction of the product owner, comprises the product backlog which is the list of to-do items for the whole project. After the construction of the Product backlog, they collectively decide when the project is considered finished by stating the Definition of Done. Then the team decides which of the Product Backlog items will be worked in the upcoming sprint and this smaller list is the Sprint Backlog. After this meeting the work starts for a predefined period called the Sprint, the main event and heart of scrum. At the beginning of each workday the third event happens under the directions of the scrum master, and this is the Daily Scrum. It is a meeting that should last less than 15 minutes, and the purpose is for the scrum master to remove any impediments the team may encounter and after a short discussion with the developers, to re-plan or adapt the work for the rest of the day. The sprint outcome is reviewed by the team, in the event called Sprint Review, where after inspection and assessment of the completed work, it will be decided if a product Increment is produced. The fifth event is the Sprint Retrospect which closes the iteration circle of the scrum. In this meeting which is held with the developers and the scrum master only, the scope is to discuss the tools, processes and interactions that took place during the sprint, in order to decide which to keep and which to discard for the team to improve in the next sprint. In each iteration happens the production of the three artifacts. The iteration cycle of Scrum is depicted on Fig. 1

2.4 Scrum artifacts

The very first one, The Product Backlog is the written form of the vision and the priorities that lead to the final product. Although this is decided at the first Sprint Planning it can and must be refined in each cycle. Product Owner is responsible for the prioritization of the items listed there but every team member can add items at any time. Only the Product Owner can delete items form the Product Backlog. The second artifact is the Sprint Backlog; a subset of the Product backlog. The last artifact is the sum of the completed work of each sprint, that gives value and leads to the Definition of Done as it was stated in the Sprint Planning. The Product Backlog is the tool for setting the learning outcomes of the project and the self-organization and self-management of the scrum team is the drive for the participants to engage actively not only to the accomplishment of the learning objectives but also for the cultivation of parallel soft skills, along the project evolution. The iterative nature of the framework's ceremonies along with the constant inspection, feedback, and adaptation, gives the students the opportunity to learn by their own mistakes and adapt accordingly for their next sprint review.
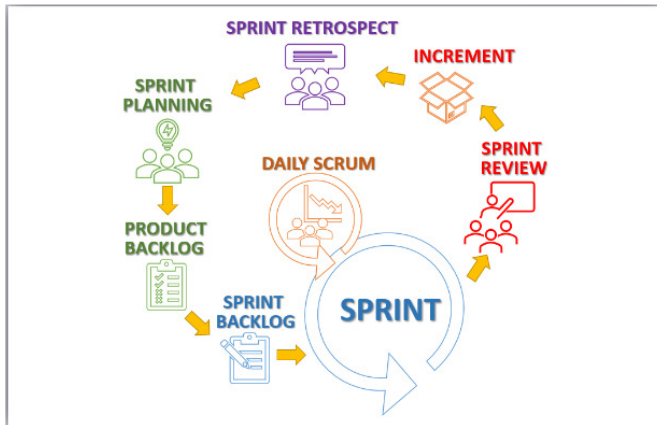
Figure 1. Scrum iteration cycle

3   Methodology

3.1   Description

The project was conducted in a voluntary basis in the undergraduate Physics II course of the second semester of the Electronics Engineering School of the Hellenic Mediterranean University of Greece. The novelty was in the remote implementation of the framework since remote teaching conditions were imposed due to covid-19 pandemic lockdown. The main objective was for the students not only to learn physics' concepts and laws but also to be able to link them with real electric and electronic devices, using the Scrum framework. Secondary objective was to create a bigger engagement from them -concerning their online lectures- by transferring onto them the responsibility of their learning. The way towards that goal was through cooperation, collaboration, and research in self-managed group of peers as the scrum framework advocates. After a comprehensive online lecture about the scrum guide and the framework, ten students enrolled for the project, knowing that this project was on top of any other obligation in the university and that they will be given extra credit only if they pass the course final exams given in the conventional way for the online teaching as the rest of the classroom. The project was conducted in two phases throughout the semester, with two different team setups for each phase to evaluate the feasibility of scrum events in a nonstandard team composition. The role of the Product Owner was taken by the teaching professor of the class and the role of the Scrum Master was taken from a PhD student of the same professor.

3.2 Developers

Three teams were made for the first phase, with three students in the first two teams and four students in the third team. The division was made by the Scrum Master (PhD student) so to incorporate in each team different levels of knowledge/experiences, since the participants were from different semesters. In the second phase, two teams were comprised from the remaining nine students with four and five students respectively in each team. Effort was made to mix the members of each team of the first phase, with members from other teams so to investigate the team interactions and effects on collaborative learning.

3.3 Final Product

The final product of the first phase was a 45-minute presentation explaining the function of an electronic/electric device that relies on the concepts and theory of the backlog items. Each of the three teams had a different device to describe and the Definition of Done from the Product Owner (the professor) was to explain the function of the device using terms and meanings of the related physics course and not with popular science terms. For the second phase, both teams were asked to deliver a 45-minute presentation of the same electric device, again with the same obligation of explaining the function of the device by relating its features with the physics principles they have learned.

3.4 Product Backlog

The framework dictates that the scrum team along with the stakeholders, must create the product backlog in the very first sprint planning event. Instead of that, the backlog was constructed by the Product Owner and was given ready to the Developers to accomplish in the upcoming sprints. The long-term reason for that was to assure that all the participants were given the correct learning objectives for this project and because the backlog items must have been identical with the main physics II topics that were taught remotely during the semester. In that way the teams would have at least one source of information about their project. Another reason for the ready-made product backlog was the coherence of the required learning objectives between the two phases of the project and the coherence with the course syllabus.

3.5 Sprint Backlog

Each team of decided on which items from the product backlog they will focus for the next sprint, and this was the Sprint Backlog. The goal for each team was to learn, understand and be able to teach in a simplified manner, the items of the backlog. The way for achieving this goal was left to the teams itself with the advice from the product owner, to also attend the online lectures of the course, as a valuable source of information about their project.

3.6 Artifacts

Apart from the Product Backlog that was prepared by the professor, all the teams should make a Sprint Backlog for each sprint at the Sprint Planning meeting, that is held at the beginning of each Sprint. The items in the Sprint Backlog were chosen from the Product Backlog as per team's desire. The last required artifact was the Increments which in our project case was a proof of gained knowledge during the sprint.

3.7 Increments

For the teams to prove that they have gained the necessary knowledge during each sprint, they were asked to provide a 30-minute presentation in each Sprint Review meeting, explaining all the items in the sprint backlog, in a teaching manner. The purpose for that was to evolve each team member's soft skills in communication, collaboration, critical thinking, and deadline keeping. For succeeding in the latter, a burndown chart was required in each daily scrum meeting, to be filled according to the sprint's work completion.

3.8 Sprint Planning Meetings

This crucial ceremony for the scrum framework was organized through teleconference session in pre-planned dates, at the beginning of each new sprint. For educational purposes and time efficiency, a single meeting was held for all the teams so each participant student could gain valuable experience on the way other people think, talk and behave on an online meeting, where important decision should be made collaboratively and with consensus.

3.9 Sprint Structure

The first phase was divided into three sprints of fourteen days each as per Table 1, and the secondary objective was to guide the students into PowerPoint presentation making and proper ways of presenting remotely their work. The guidance was done by the Scrum Master incrementally in each daily scrum meeting by advising and pointing to the right sources for research. The Scrum Master didn't supervise each team's work (with the classical meaning of the term) because the primary objective remained and was the cultivation of self-learning, self-managing, collaborative learning and engagement, actions that lead directly to the active learning concept [13]. He only helped them stay in the right research direction, allowing small deviations for educational purposes. Besides that, Scrum Master provided incentives and posed theoretical questions to the teams, to improve their critical thinking and analysis, from one daily scrum meeting to the next. In the second phase there was only one sprint period which lasted three weeks, from 10th of May 2021 until 28 of May 2021. The reason for scheduling only one sprint was that of discovering how do they perform in longer deadlines, without the feedback of multiple sprint review meetings before the final delivery of the product.

Table 1. Start and end dates for the three scheduled sprints of the 1st phase

Sprint	Start Date	End date
Sprint 1	8 March 2021	21 March 2021
Sprint 2	26 March 2021	9 April 2021
Sprint 3	12 April 2021	24 April 2021

3.10 Daily Scrum Meetings

As the official scrum guide dictates [20], at the beginning of each working day a daily scrum meeting with the scrum master should take place so to track completed and remaining work, interactions, and problems the team may encounter. Due to the self-managed feature of the scrum teams, each team decided to work in different time slots during the week so to accommodate every team member's need for the rest of the semester enrolled courses. The daily scrums were taken place at the beginning of the working day of each team and the duration was depended on the team's needs but never exceeded half an hour. For both the phases, each team was encouraged to provide a weekly schedule of the next week which stated the days and time windows where the project work should take place. This was not a scrum artifact but solely a helping aid for coordination between the scrum master and the developer teams.

3.11 Sprint Review Meetings

The event of the Sprint Review was held in Zoom online tool with all the teams virtually present during each team's 30-minute sprint presentation. The aim of each presentation was for each team, to demonstrate in a teaching lecture manner their level of understanding of the Backlog Items they had chosen. The Developers were encouraged to choose their own way of presenting their work but with a set of criteria given by the Product Owner. Through these assessment criteria the students were able to prepare their presentation by their own means and without the intervention of the Scrum Master or the Product Owner. Each online presentation was followed by a 30-minute Q & A period where the professor asked each team member, key questions about the content of their presentation, to assess the level of understanding on each physics law or concept that was presented and is linked with the operation the device was targeted. Members from other teams were permitted to ask questions to the presenting team for exchanging ideas and provoking a discussion on the subject of the presentation.

3.12 Sprint Retrospective Meetings

This important event for team's evolution was held the next day of the Sprint review, separately for each team and the focus was on how the team members interacted during the sprint. Also, there was a discussion on the way the group worked in terms of Product Backlog

items research and handling. By encouragement of the Scrum Master, the students decided by consensus if the methods and tools used the previous sprint are suitable for the next one.

4   Results

In the very first Sprint Planning meeting, all the students together, decided that the most suitable platform for this online experience is the popular Discord. It is designed for virtual interaction between people with common interests in video games, available for personal computers and all kinds of smart handheld devices like smartphones and tablets. It is free of charge and the overall setup of the application in text and voice channels, made it ideal for the purposes of the project. With the help of the most experienced in Discord student, all teams created their own virtual working space, the Scrum server, with virtual rooms inside it, that suited the needs of each team.

The application offers the possibility of voice and video interaction between members on the click of a mouse button, and the upload/download of any kind of digital file up to certain size, depending on the type of the file. It also offers the share screen function that proved valuable when one student was presenting his finding on a Product Backlog item, to the other team members. In this first Sprint Planning and on each subsequent one, there were two distinct processes that took place. The first was the construction of the Sprint Backlog in which each team, decided which Product Backlog items will be included in this sprint work. The second process and most difficult one, was to decide by estimation, how many hours will need for each item to complete. The sum of those hours, called the Sprint effort was put on the vertical axis of the Burndown chart, where the calendar days of the Sprint were on the horizontal axis.

Daily scrum was conducted on each working day, in the Discord platform for discussing the three questions of the Daily scrum. Each team had its own pace of work, which was decreasing through the 1st phase of Scrum, as Table 2 shows. Right at the start of the Daily Scrum, the team presented the updated Burndown chart like in Fig 2, where a small discussion was made on the progress of the team's work. The preferred method of presenting the chart was the MS Excel spreadsheet which offered flexibility of correcting and updating the chart remotely using cloud services. Afterwards and according to the guide [20], the Scrum master asked each team member individually, in the presence of the whole team, what he have done the previous working day, what he will do this day and if there are any problems impeding his work.

The duration of Daily Scrums averaged 30 minutes and that was due to the coaching done by the Scrum Master, after finishing the typical Scrum obligation of the three questions to each student. This coaching was deemed necessary to help the students enhance their soft skills of digital literacy, communication, decision making, critical thinking, research methodology and time keeping. The way of coaching was through pointing to the right source in the literature for them to investigate and not by answering directly to the emerging questions. The increments produced in the 1st phase of the project, were six PowerPoint

presentations that where presented, in the 1st and 2nd Sprint Review. The 2nd phase had no increments because there was only one Sprint with the final Product delivered at the end of it. Five Products were delivered in total and were again PowerPoint presentations according to the Product Backlog. 65 Burndown charts was produced by the students, indicating the total hours they spent on the project.

The hours assigned by estimation on each Sprint, were different for each team as per Table 3. During the Q/A sessions that followed each presentation of an Increment, the teams were asked how they estimated the number of hours for the Sprint, and the answer by all the teams was by deliberation, without following any specific methodology. That led Team 1 on estimating more hours than needed and Team 2 the exact opposite. Only Team 3 managed to estimate quite accurately the amount of effort needed for each Sprint.

Table 2. 1st phase's working days per Sprint, per team

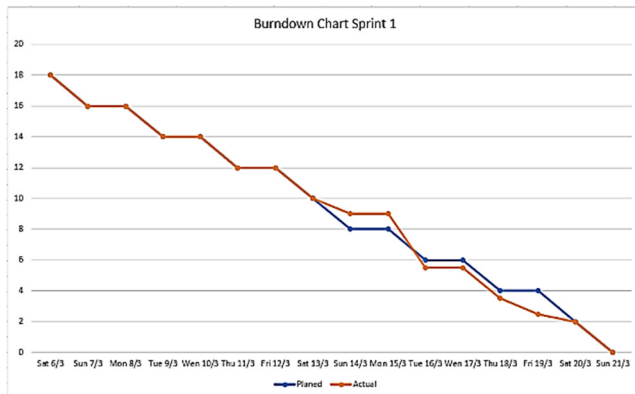|	**No Scrum**	**Scrum**	**Total**
Enrolled students			137
Participants in final exam	92	8	100
Pass within participants	31	5	36
Success rate	34%	63%	36%
Average final exam grade	3.8	6.7	4.0

Figure 2. Burndown chart

As it was stated earlier in this paper, this effort was additional to the conventional effort of the class taught online. The end of the project coincided with the end of the semester, where the Scrum students undertook the final exams like the rest of the enrolled students. The grade system on the Hellenic Mediterranean University, where this study was conducted, qualifies a score of above five out of ten, as a pass score.   The overall exams result of the whole class are shown on Table 4. For comparison reasons the enrolled students divided into three categories, those who participated on the Scrum project, those who didn't and the total students. Fig. 3 presents the final exam grades distribution per category.

Table 3. Sprint effort in hours for each team

		Team 1	Team 2	Team 3
1st Phase	Sprint 1	30	13	21
	Sprint 2	35	16	20
	Sprint 3	26	18	20
		Team "Generator"	**Team "Full House"**	
2nd Phase	Sprint 1	22	20	

Table 4. Exams results of the Physics II course

Sprint	**Team 1**	**Team 2**	**Team 3**
1st	6	5	8
2nd	5	5	6
3rd	5	3	5

After the end of the semester, the participants were asked for their feedback on the Scrum experience, through an online questionnaire with 23 questions. The most significant responses are shown to Fig. 4 to 7.
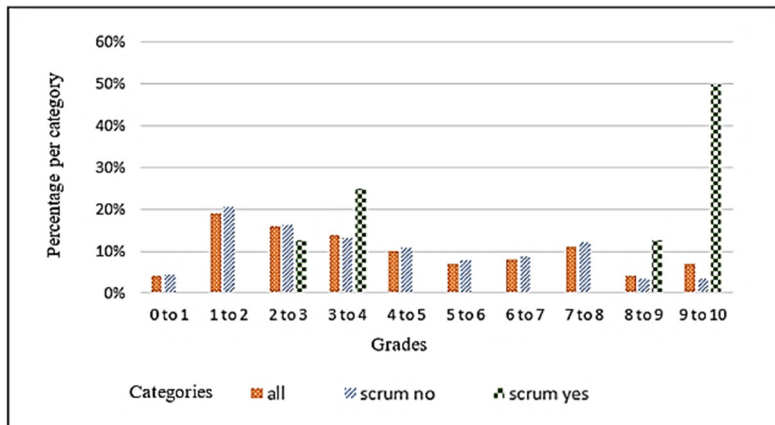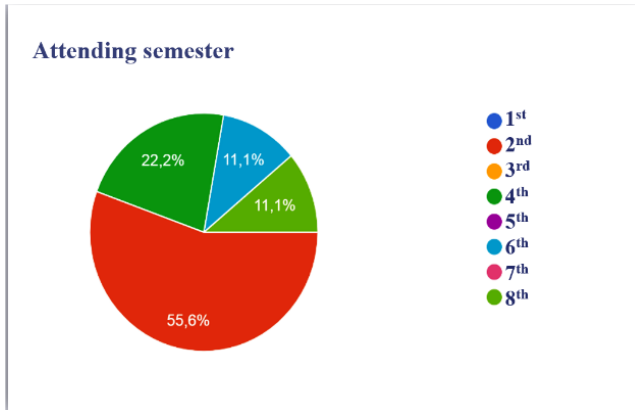

Figure 3. Grades distribution

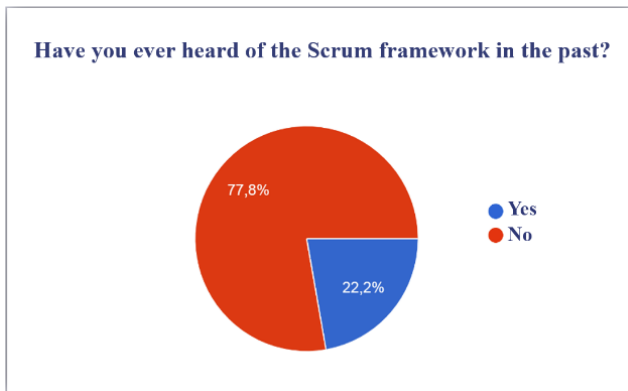**Figure 4.** Attending semester distribution among Scrum participants

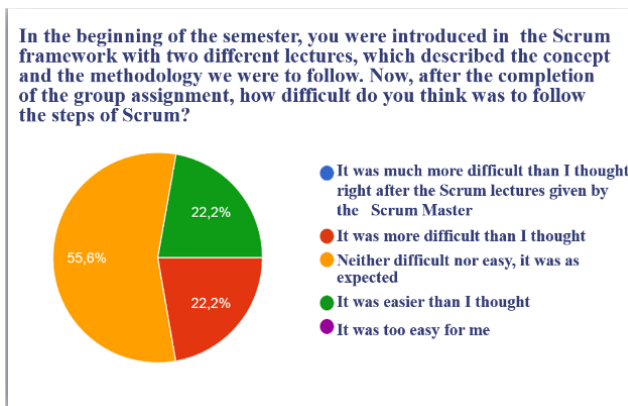**Figure 5.** Student's awareness on Scrum framework

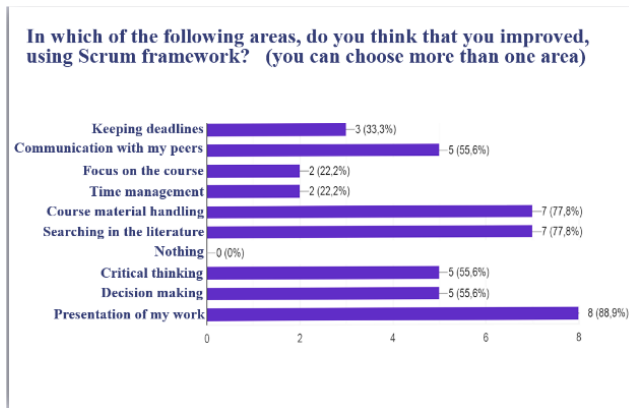**Figure 6.** Perceived difficulty of Scrum framework

Figure 7. Participant's perceived evolution on soft skills

5   Discussion

The engagement of the students on the Scrum project was apparent from the first Sprint Planning where they cooperated to decide what platform to use for their meetings and work. This engagement remained constant throughout the project since there were only two instances where a student of each team was absent, on a total of 48 Daily Scrums on the 1st phase. The three Scrum questions posed by the Scrum Master in each Daily Scrum to each team member, provided the Scrum Master a way of documentation of the progression of each member on embracing the values of Scrum. Although in the beginning was difficult for some students to express themselves openly, by the frequent iteration of the Daily Scrums, the value of openness was more and more embraced by all the students. This openness led them to receive and give respect among the team, which in turn drove them to have the courage to admit shortcomings and personal defects that affected the team's work. But the most evident evolution on student's behavior was the commitment they showed to the task, during the project. This commitment and focus were observable through the frequent virtual visits of the Scrum Master, on the Discord Platform, where he was able to silently watch the teams working in their respective space. Another task that proved difficult was that of predicting the work needed for the Sprint Backlog items.

Two teams were unsuccessful on precisely estimating their effort in the beginning of each sprint, but this was not a problem since the dynamic nature of Scrum permits corrections and adaptations to every action made towards the Sprint goal. Both the Product Owner and The Scrum Master witnessed the performance of the students on the presentation of their work, on each Sprint Review, which varied from adequate in the first meetings to very good at the end of the project. The evolution on their presentation skills was due to the repetitive process of Sprint Reviews and the feedback from the Product Owner, who was also the professor delivering the course.

At the same time, the professor evidenced the progression on their acquired knowledge, though their responses to the oral questions he posed in each student individually, in every Sprint review. The questions were according to the course's learning outcomes, in an increasing difficulty manner, throughout the progression of the project. This fact was ultimately proved true from the exam results of the students participated on the Scrum project, as shown on Table IV. On top of that, the grades the Scrum students achieved were higher in percentage, than the grades of the rest of the class. Although the teams didn't produce the Product Backlog, the artifact of Sprint Backlog was correctly created from all the teams, since they managed to deliver the backlog items on the end of each Sprint. The last artifact of the Sprint increments, which were the half an hour presentation, evaluated as of ascending quality by the Product Owner and the Scrum Master.

6   Conclusions

The engagement of the students on the Scrum project was apparent from the first Sprint Planning where they cooperated to decide what platform to use for their meetings and work. This engagement remained constant throughout the project since there were only two instances where a student of each team was absent, on a total of 48 Daily Scrums on the 1st phase. The three Scrum questions posed by the Scrum Master in each Daily Scrum to each team member, provided the Scrum Master a way of documentation of the progression of each member on embracing the values of Scrum. Although in the beginning was difficult for some students to express themselves openly, by the frequent iteration of the Daily Scrums, the value of openness was more and more embraced by all the students. This openness led them to receive and give respect among the team, which in turn drove them to have the courage to admit shortcomings and personal defects that affected the team's work. But the most evident evolution on student's behavior was the commitment they showed to the task, during the project. This commitment and focus were observable through the frequent virtual visits of the Scrum Master, on the Discord Platform, where he was able to silently watch the teams working in their respective space. Another task that proved difficult was that of predicting the work needed for the Sprint Backlog items.

Two teams were unsuccessful on precisely estimating their effort in the beginning of each sprint, but this was not a problem since the dynamic nature of Scrum permits corrections and adaptations to every action made towards the Sprint goal. Both the Product Owner and The Scrum Master witnessed the performance of the students on the presentation of their work, on each Sprint Review, which varied from adequate in the first meetings to very good at the end of the project. The evolution on their presentation skills was due to the repetitive process of Sprint Reviews and the feedback from the Product Owner, who was also the professor delivering the course.

At the same time, the professor evidenced the progression on their acquired knowledge, though their responses to the oral questions he posed in each student individually, in every Sprint review. The questions were according to the course's learning outcomes, in an

increasing difficulty manner, throughout the progression of the project. This fact was ultimately proved true from the exam results of the students participated on the Scrum project, as shown on Table IV. On top of that, the grades the Scrum students achieved were higher in percentage, than the grades of the rest of the class.

Although the teams didn't produce the Product Backlog, the artifact of Sprint Backlog was correctly created from all the teams, since they managed to deliver the backlog items on the end of each Sprint. The last artifact of the Sprint increments, which were the half an hour presentation, evaluated as of ascending quality by the Product Owner and the Scrum Master.

References

[1]   Oya Tamtekin Aydin, "Current developments and trends in higher education," Journal of Business, Economics & Finance ISSN: 2146 – 7943, Vol. 3, Iss. 4,2014

[2]   Scrum Manifesto, www.scrummanifesto.org (accessed June 25, 2021)

[3]   Mia Persson, Ivan Kruzela, Kristina Allder, Olof Johansson and Per Johansson, "On the Use of Scrum in Project Driven Higher Education", ResearchGate.net, 2012

[4]   Antonio Jurado-Navas & Rosa Munoz-Luna "Scrum Methodology in Higher Education: Innovation in Teaching, Learning and Assessment" International Journal of Higher Education, Vol. 6, No. 6, 2017

[5]   Hwai-Jung Hsu, Eason Lin, Kiki Chang, Elton Hsiao, "Practicing Scrum in Institute Course", Proceedings of the 52nd Hawaii International Conference on System Sciences, 2019

[6]   World Economic Forum "The Future of Jobs Report 2020", https://www.weforum.org/reports/the-future-of-jobs-report-2020 (accessed June 25, 2021)

[7]   Shaheen Majid, Zhang Liming, Shen Tong, Siti Raihana, "Importance of Soft Skills for Education and Career Success", International Journal for Cross-Disciplinary Subjects in Education (IJCDSE), Special Issue Volume 2 Issue 2, 2012

[8]   Ms. Charu Sarin, "Analyzing Skill Gap between Higher Education and Employability", Research Journal of Humanities and Social Sciences, October 2019

[9]   Anealka Aziz Hussin, "Education 4.0 Made Simple: Ideas For Teaching", International Journal of Education & Literacy Studies, 2018

[10]   Patel, K. B., Maina, M., Hagmann, J. and Woomer, P. L.. "Curriculum development and transformation in rural development and natural resource management: a strategy workshop." Conducted at the Rockefeller Foundation's Bellagio Center in Italy, November 12–16, 2001.

[11] Moyo, E. and Hagmann, J., "Facilitating competence development to put learning process approaches into practice in rural extension." In FAO: Human resources in agricultural and rural development. Rome: FAO, pp. 143-157, 2000

[12] Andy Hon Wai CHUN, "The Agile Teaching/Learning Methodology and its e-Learning Platform", Lecture Notes in Computer Science-Advances in Web-Based Learning Volume 3143, Springer-Verlag Heidelberg, pp. 11-18, 2004

[13] Marco Klopp et al., "Totally Different and yet so Alike – Three Concepts to Use Scrum in Higher Education", ECSEE '20, 2020

[14] Michael Norbert et al., "Active Versus Passive Teaching Styles: An Empirical Study of Student Learning Outcomes", Human Resource Development Quarterly, vol. 20, no. 4, Winter 2009

[15] Freeman et al., "Active learning increases student performance in science, engineering, and mathematics", PNAS,VOL111, no 23, 2014

[16] Theobald et al., "Active learning narrows achievement gaps for underrepresented students in undergraduate science, technology, engineering, and math", PNAS, vol 117, no 12, 2020

[17] Louis Deslauriers, Logan S. McCarty, Kelly Miller, Kristina Callaghan and Greg Kestin, "Measuring actual learning versus feeling of learning in response to being actively engaged in the classroom", PNAS,VOL116, no 39, 2019

[18] Charles C. Bonwell, James A. Eison, "Active Learning: Creating Excitement in the Classroom", ASHE-ERIC Higher Education Reports, 1991

[19] Krehbiel et al, "Agile Manifesto for Teaching and Learning", The Journal of Effective Teaching, Vol. 17, No.2, 90-111, 2017

[20] Ken Schwaber & Jeff Sutherland, "The scrum guide-The Definitive Guide to Scrum: The rules of the game", 2020, https://scrumguides.org/docs/scrumguide/v2020 (accessed June 25, 2021)