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SCRUM IMPLEMENTATION AND PRACTICE IN THE SUBJECT OF PROJECT FORMULATION AND EVALUATION IN THE ECONOMIC AND ADMINISTRATIVE SCIENCES DEPARTMENT AT UNIVERSIDAD EL BOSQUE

IMPLEMENTACIÓN Y PRÁCTICA DE SCRUM EN LA ASIGNATURA DE FORMULACIÓN Y EVALUACIÓN DE PROYECTOS EN LA FACULTAD DE CIENCIAS ECONÓMICAS Y ADMINISTRATIVAS DE LA UNIVERSIDAD EL BOSQUE

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Resumen: En los últimos años, la metodología ágil ha venido revolucionando el mundo de los proyectos (Rigby et al., 2016), y es cada vez más usada por diferentes industrias a nivel mundial (KPMG, 2019). Uno de los marcos más adoptados dentro de esta metodología es Scrum (Kapitsaki & Christou, 2014). Con Scrum se busca tratar los proyectos de manera iterativa y adaptativa, brindándole flexibilidad a la toma de decisiones durante el desarrollo de los proyectos. En este estudio de caso, se realiza un análisis de la implementación y el desarrollo de proyectos con Scrum en una facultad de ciencias económicas y administrativas, donde estudiantes de dos carreras afines (administración de empresas y negocios internacionales) aprenderán y desarrollarán sus proyectos bajo Scrum. Este ejercicio se ejecutará durante tres sprints de dos semanas, en los cuales los participantes realizan todos los eventos y entregan un producto terminado. Se encontró que los estudiantes lograron desarrollar sus proyectos de manera óptima, junto con una mejora en su forma de trabajar en equipo. Para los estudiantes, Scrum se convierte en una nueva forma de desarrollar sus proyectos e incursionar en el mundo laboral. Finalmente, se logra una implementación satisfactoria que indica la importancia del aprendizaje de Scrum en facultades de negocios.
Palabras clave: Metodología, agíl, scrum, proyectos, aprendizaje.

Abstract: The Agile methodology has revolutionized the world of projects (Rigby et al., 2016) in recent years, different industries are increasingly using it worldwide (KPMG, 2019). One of the most widely adopted frameworks within this methodology is Scrum (Kapitsaki & Christou, 2014). Scrum deals with projects in an iterative and adaptive manner, providing flexibility in decision-making processes that occur while developing projects. In this case study, an analysis of the implementation and development of projects with Scrum was conducted in an economic and administrative sciences department, where students from two related careers (business administration and international business) set out to learn and develop their projects with Scrum. This exercise was executed in three two-week Sprints in which participants performed all ceremonies and delivered a finished product. It was found that students managed to

develop their projects in an optimal way, and a notable improvement was noticed in their way of working as a team. For students, Scrum became a new way to develop their projects and break into the labor market. Finally, the successful implementation achieved indicates the importance of learning Scrum in business schools.
Agile methodology; Scrum; project management; eduScrum; Agile learning.

Introduction

This introduction takes us back to the 90's, a time in which the software industry was being globally revolutionized and in which great companies such as Google, Yahoo, PayPal, etc., were founded. Back then, software developers were faced with issues deriving from business practices; new ways of conducting and dealing with projects were explored since deliverables were difficult to understand for teams, especially in the IT industry. In 1993, Jeff Sutherland, Jeffrey Mackenna, John Scumniotales and Ken Schwaber began developing a new processes framework; the term for this framework, inspired by the work of Hirotaka Takeuchi and Ikujiro Nonakatomara in 1986, was Scrum, the word was borrowed from rugby and references key formation required for the team's success (Ungvarsky, 2017).

Scrum is defined by Schwaber and Sutherland (2017) as a "framework used by people to address complex adaptive problems while delivering products with the greatest possible value at productive and creative level."(p.3). Although Scrum is introduced as a "framework that is light and easy to understand," it can also be "hard to master." As stated by Babaian (2019), despite the success of projects in Scrum, companies have not fully switched to this framework due to the organizational culture shift it entails.

Scrum has been used mostly in the IT industry, however, applications in other private and public economic sectors have been realized in recent years, including the educational sector.

Schwaber and Sutherland (2017) established that Scrum is based on the theory of empiricism, and that Scrum uses an "iterative and incremental approach to optimize predictability and risk control" (p.4). The authors add that the implementation of Scrum is grounded on three pillars, as follows:

-Transparency: participants must share an understanding of the processes and have the same definition of "done" (finished), significant processes must be visible for each member of the team.

-Inspection: frequent inspections are necessary (without interfering in the work) to avoid unwanted variations.

-Adaptation: the team must be able to adapt in case changes are required after the inspection. Inspection and adaptation processes take place in each of the Scrum's four limited-time ceremonies per Sprint.. Table 1 summarizes the ceremony's main characteristics:

Ceremony	Objective	Length	Participants
Sprint Planning	To plan the work to undertake in the Sprint, answering questions such as: • What can be delivered in the increment resulting from the Sprint that is beginning? • How will the necessary work be done to deliver the increment? The Sprint's objective is discussed, as well as the backlog and the time the team takes developing each item of the backlog.	8 hours at most for a 1-month Sprint	Entire Scrum team: Product Owner, Scrum Master, Development Team
Daily Scrum	The Development Team discusses and plans the work of the next 24 hours, answering questions such as: • What did I do yesterday to achieve the Sprint's objective? • What will I do today to achieve the Sprint's objective? • Do I identify an obstacle to achieve the Sprint's objective? The progress towards the Sprint's objective is evaluated and the team's communication is improved.	15 minutes a day at most	Development Team * The Scrum Master makes sure the team can conduct the meeting.
Sprint Review	The Sprint is reviewed. • The Product Owner explains the finished and pending elements of the backlog, with the respective planning. • The Development Team talks about what was right throughout the Sprint, which problems came up and how these were solved, they also conduct a demonstration of the finished work. • The complete group analyses the steps to follow, clarifying elements for the next Sprint Planning	4 hours at most for a 1-month Sprint	Entire Scrum team, interested parties.
Sprint Retrospective	This ceremony intends for the team to inspect itself, how was the last Sprint like in terms of people, relationships, processes and tools; • Identify and organize the most essential elements that went well and possible improvements; and • Create a plan to implement the improvements to the way in which the Scrum Team executes its job.	3 hours at most for a 1-month Sprint	Entire Scrum team

Table 1

Scrum Ceremonies

Compiled by the author based on Schwaber & Sutherland (2017).

The Scrum Teams are made up by a Scrum Master (SM), Product Owner (PO) and the Development Team (DT). This enables teams to self-organize, waiving the direction of personnel outside the team. This model allows the team to be creative, more effective and motivated.

Each part of the team has a fundamental task. The Scrum Master promotes Scrum in the team, supporting and disseminating the concepts of Scrum in the team and the organization. The SM oversees the realization of the ceremonies and helps the team to avoid problems in the Sprint. The Product Owner is responsible for maximizing the value of the resulting product, the PO is solely liable for the backlog's management. The Development Team is the group that will develop the increment of the finished product, it must be capable to self-organize and to be multifunctional; the DT should be made up of three to nine people to be simultaneously productive and Agile (Schwaber & Sutherland, 2017).

As mentioned by Babaian (2019), "since it has been successfully utilized to integrate an Agile mentality in the development and delivery of complex products in several industries, Scrum is a convincing framework for any organization." (p.11).

According to Vogelzang et al. (2020), Scrum is gradually being used in academic environments. It is applied in higher education and in the last grades of elementary. The application of Agile methodologies is evident in examples such as eduScrum, Blueprint and Agile learning (Kuz et al., 2018).

For instance, at the level of academic training in systems engineering, Cico et al. (2020) found that the most popular trend in education is Agile software development, followed by software implementation, usability and value. Within the Agile methodologies, they found that the practice of Scrum is among the most common. On the other hand, Hidalgo (2019) explored the adoption of Agile methods in project management of collaborative research initiatives, resulting in the adoption of these methodologies, the Scrum framework in particular, which "requires a high degree of flexibility and an approach of learning while doing". Finally, Vogelzang et al. (2020) review the perspective of using Scrum in a high school chemistry class.

Method

Configuration and Participants

This article follows the case study research methodology. A proposal to introduce Agile methodologies in the Economic and Administrative Sciences Department at Universidad El Bosque was presented and several proposals for the exercise were reviewed, leading to the decision that the most feasible and viable consisted in the creation of project in the subject of project formulation and evaluation. This subject is part of the curriculum of two of the departments' programs: business administration and international businesses.

This subject reviews project management's traditional theories, noticeably, the development of cascading projects. In this case, the intention was to virtually undertake a basic course on Moodle, in order for a group of students to train in the Scrum framework and Agile methodologies in the subject.

There was an initial explanation as to why and how Scrum would be implemented in the subject, socializing the new implementation with students; secondly, as to how to prepare (virtual modality) (Vogelzang et al., 2020) and how to develop their projects. A total of 64 students from both programs participated.

These topics were reviewed with the students in the first two weeks. Afterwards, students had an additional week to assembly their teams (five to nine students), assign their roles in the Scrum Team (SM, PO and DT), to finally begin working on their project in week 4. It was decided that projects had to be developed in three two-week Sprints. The following is the activities' planning:

Date	Topic	Students' Activity
W1	Agile methodologies, Scrum (uses, values, pillars). Team in the Scrum (roles, SM, PO, DT).	Review and analyze the content of the virtual classroom. Forward questions or doubts.
W2	Scrum Ceremonies (Sprint, Sprint Planning, Daily Scrum, Sprint Review, Sprint Retrospective), artifacts (backlog, product backlog, product increment), definition of done or finished.	Review and analyze the content of the virtual classroom. Forward questions or doubts.
W3	Setting up teams and beginning the Sprint.	Set up the teams per the instructions document. Teams must be made up by a minimum five and a maximum nine students. A project in the list must be selected and the backlog must be created. Appoint the team's members' roles. Finally, record information in the log.
W4 – W5	First Sprint: Electing the Sprint's product backlog. Developing the ceremonies (Sprint Planning, Daily Scrum, Sprint Review, Sprint Retrospective).	Deposit the evidence, progress and increments achieved in the Sprint in the virtual classroom.
W6 – W7	First Sprint: Electing the Sprint's product backlog. Developing the ceremonies (Sprint Planning, Daily Scrum, Sprint Review, Sprint Retrospective).	Deposit the evidence, progress and increments achieved in the Sprint in the virtual classroom.
W8 – W9	First Sprint: Electing the Sprint's product backlog. Developing the ceremonies (Sprint Planning, Daily Scrum, Sprint Review, Sprint Retrospective).	Deposit the evidence, progress and final increment in the virtual classroom, as well as the total development of the selected project.

Table 2
Activities' Planning
Source: compiled by the author (2021).

In week 3, students had to select their teams per the Scrum rule, groups had to be made up of a minimum of three and a maximum of nine people, since they need to be small enough to remain Agile and large enough to carry out significant work in a Sprint (Schwaber & Sutherland, 2017). Nevertheless, due to the fact that this was an academic exercise of large groups, it was decided that groups had to be of a minimum of five and a maximum of nine people. Each team had to select the project from a fixed list; projects were not exclusive, i.e., several groups could chose the same project. Finally, they had to select their roles in the team, per Schwaber & Sutherland (2017), teams need to be self-organized and multifunctional, respecting themselves to be capable and independent. The project's backlog also needed to be created in that week.

Projects, including Scrum ceremonies, would take place in weeks 4 to 9. For the Daily Scrum, students were told they could have them less frequently in order to comply with commitments of other subjects in the students' study plan.

Upon finishing the projects, students took a survey with open and closed-ended questions aimed at understanding their perception of the importance, limitation and preferences pertaining to Scrum.

Results

Out of the fifteen projects presented to the students, the selected ones were as follows:

Project	No. of Teams
Setting up an e-shop	4
Wedding planner project	2
Setting up and launching a restaurant	1
Shampoo export	1
Making and delivering a flower sculpture	1

Table 3
Projects Selected by the Students
Source: compiled by the author (2021).

There was a preference for the topic of setting up an e-shop, an in-depth inquiry showed that students were more familiarized with this type of projects thanks to an e-commerce subject in which students had learned the core processes to develop these businesses.

Some students requested tutorships to clarify issues regarding the methodology. Although it was initially instructed that questions could be sent via e-mail and answered quickly, a session to clarify doubts in real time was organized. Most doubts had to do with the backlog during the Sprints, and the beginning and ending of each Sprint.

Sprint 1

The first Sprint was characterized by students' lack of experience. Even though the content of the work to be delivered had been explained, most of it was incomplete or had execution mistakes in the ceremonies. In the Sprint, the questions of five groups were answered via e-mail. One of the most common problems was the development of the dailies, students failed to execute this ceremony correctly and in the right timeframe. After work was delivered, feedback was given as to what to improve in the upcoming Sprint. It is worth mentioning that two groups did not deliver any work in the first Sprint.

Sprint 2

In the second Sprint, students did not have any questions while developing their projects. Most groups understood the dynamic and correctly submitted their work, including the recommendations in the feedback. Nevertheless, questions persisted in terms of the execution of the dailies. Most of them used this ceremony to plan activities but not to undertake the inspection of the DT and the project's development. This ceremony was explained again in the feedback, along with some recommendations pertaining to documents' organization. One of the groups did not deliver any work in this Sprint.

Sprint 3

Students worked properly and constantly, since this was the last Sprint, also, they submitted considerably better work. The project had to be 100% developed and the backlog had to be 100% completed. Students presented their finished projects on time. The dailies improved but still had some issues. Two groups did not deliver any work in this Sprint.

In the feedback, students seemed to be motivated and satisfied about learning a new way of developing projects. "Truthfully, we are excited to know we did things right," "me and my team talked and learned a lot from this new methodology," "thank you very much, we learned a lot in this project."

One of the ceremonies that caught the students' attention the most was the Sprint Retrospective. This ceremony enabled them to inspect themselves as a team. In it, students mentioned: "the members of the DT identified that some lacked the creativity and attitude needed to deliver their tasks. The conclusion was that the DT accomplished the objective of knowing itself and understanding its aptitudes, which is critical in a team. However, many things needed to improve to sustain considerable progress in Sprint 2. "Our group is very disperse, but totally cooperative, so we were able to increase the scope of the results with recreational dynamics within the group"; "in my opinion, I have felt very distant from my teammates, I would like to be closer to them; in terms of performance, I can say that I am very pleased and comfortable"; "I am pleased with our performance, I think that commitment should come first when there are differences that transcend even the personal sphere"; "the team's interest was evident in each of the activities, fulfilling the expectations... finally, the project came to a conclusion in the best way, attaining the expected results".

When the projects were completed, students answered a survey on their perception of learning this new way of working. 48 answers were received in total because the groups that did not finish and deliver the projects did not take part in the survey.

When students were asked about the duality of the use of Scrum, both at professional and personal level, 91.7% (44) answered that they believe Scrum could be helpful in both scenarios, while 8.3% (4) answered they did not consider it useful. However, when students were asked if having a certification in Scrum would entail better job opportunities, 93.8% (45) answered yes and 6.3% (3) answered no. This shows a difference in the use of Scrum in personal and professional scenarios, out of the four the students who answered negatively in the first question, three indicated that the certification could be positive for their job opportunities, whereas is one student failed to acknowledge Scrum's usefulness in any scenario. On the other hand, two of the students who answered positively in the first question, considered that the certification would have no impact on their job opportunities.

Regarding Scrum's theoretical and practical part, students were asked which concepts were completely clear at the end of the projects, concepts such as Sprint, planning and roles were clearer for them, yet the ceremonies, such as the retrospective and the review were less clear.
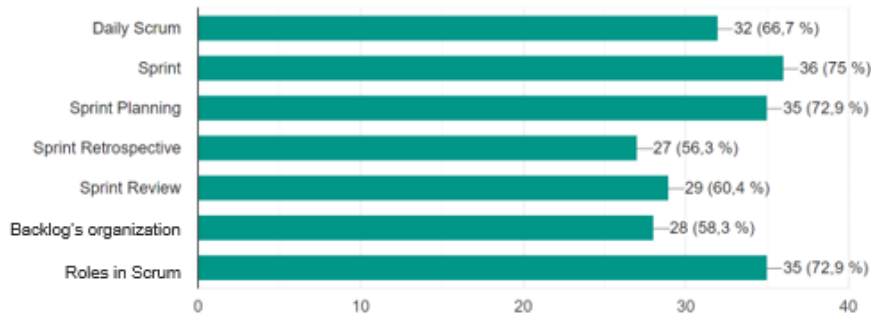
Figure 1

Understanding of the Concepts by Students

Source: compiled by the author (2021).

Students were openly asked to identify the most difficult part of the exercise. Seven of them did not find any difficulty in particular while undertaking their projects; ten students believed it was difficult to work as a team; six students had issues handling time and six of them found it difficult to deal with virtuality. One student mentioned having problems understanding the theory.
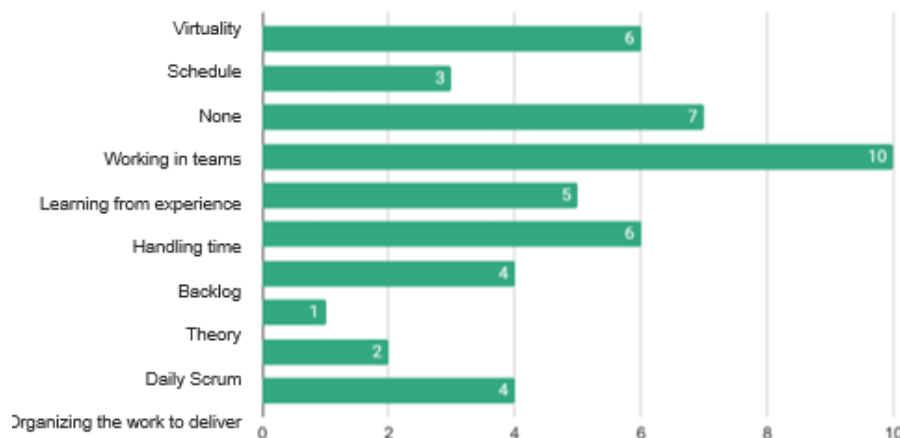

Figure 2

Difficulties Found by the Students

Source: compiled by the author (2021).

When asked if Scrum makes it easier to work as a team, 83.3% (40) answered yes, while 16.7% (8) answered no. However, only two of the ten students who identified working in teams as their difficulty, stated that Scrum fails to facilitate working as a team, while the other eight believed it did.

Finally, students were asked about their preference in learning environment for this type of topic; 70.8% (34) of them manifested they preferred a mixed learning environment with practical work conducted virtually but with some face-to-face spaces to learn the methodology.
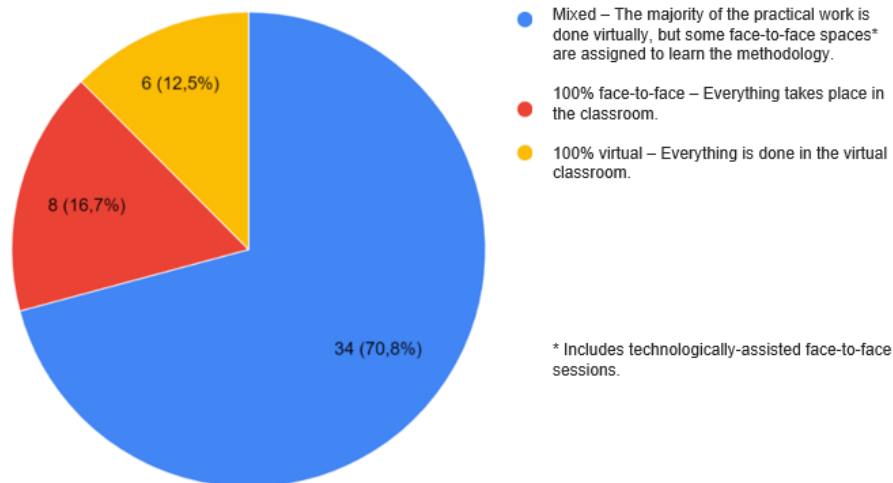
Mixed – The majority of the practical work is done virtually, but some face-to-face spaces* are assigned to learn the methodology.

100% face-to-face – Everything takes place in the classroom.

100% virtual – Everything is done in the virtual classroom.

* Includes technologically-assisted face-to-face sessions.

Figure 3
Preference in Learning Environment
Source: compiled by the author (2021).

Discussion and Conclusion

Developing and implementing new methodologies, theories, technologies, etc., in the classroom is fundamental, as asserted by Kuz et al. (2018). Students need to cultivate capacities, skills and aptitudes that will be useful in the academic environment and professional career. In our case, the implementation and practice of Scrum in the subject of project implementation, helped us understand students' perception about this new framework. As stated by Kuz et al. (2018), Scrum in education helps students to assume their own learning, defining the time dedicated to prepare and study.

Each Sprint showed progress in practical learning pertaining to the methodology. Projects were taking shape in terms of organization and communication. Learning became an action of collaboration in which each individual's assimilation affected and contributed to the success of the team's learning and growth (Kuz et al., 2018). This was clearly evinced in the Sprint Retrospective, in which students had an inspection of themselves and the group to analyze performance and changes required to improve. In this exercise, as in the research by Kuz et al. (2018), it was found that the review of each Sprint allows to monitor students' progress in real time, how they work and solve specific problems.

Based on the Scrum's implementation, the intention was to convey the teachings through practice, since the integration of Agile methods and practices requires an elevated degree of flexibility and approaches to "learning by doing" (Lauren, 2018, p.30, as cited in Hidalgo, 2019). This enabled students to interiorize processes and attain continuous improvement in each Sprint.

It must be said that 83% of the students did not have prior knowledge nor had they heard about Agile methodologies or Scrum, methodologies that are increasingly being used by global companies that

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have experimented in waterfall models but which are on a current mission to improve their existing processes to accelerate teams' participation with Scrum (Cristal et al., 2008). Right now Scrum has expanded to all types of sectors, such as software development, industry, entertainment and banking, e.g., 3M, IBM, ANZ Banking Group, Google, Spotify, (Ajmal, 2018), among others. Knowledge of Scrum represents higher employability for students when they graduate, their knowledge of project management is not limited to waterfall structures but includes managing projects in Agile methodologies. Students find it clear that learning and being certified in Scrum may become come in handy when looking for a job.

On the other hand, students prefer having autonomy to develop projects independently. Nevertheless, they still need certain parameters in terms of organization and results' presentation; they look for forms, regulations, patterns to make their results comparable between them. This might imply the need for a mixed learning environment that would grant them autonomy while taking part in face-to-face sessions to solve doubts, concerns and comments in real time.

This exercise assisted in a gratifying implementation of Scrum in two programs of the department, teaching students new ways of approaching projects. As in the research by Hidalgo (2019), new collaboration ideas, ways to conduct teamwork and share ideas were all encouraged and facilitated. On the other hand, it showed the importance of teaching Agile methodologies in business departments, in which future managers, consultants, etc., are training to perform distinct roles with the holistic view of this type of preparation. Although the implementation of Scrum initially increases the complexity of the learning environment (Vogelzang et al., 2020), it will enable satisfying results for teachers and students, for instance in the case presented.

Referencias

Ajmal, S. (2018). How Agile Scrum Training Transformed These 5 Companies. Quickstar.Com. https://www.quickstart.com/blog/how-agile-scrum-training-transformed-these-5-companies/

Babaian, A. (2019). Becoming Agile with the Scrum Framework. Software Quality Professional, 22(1), 23. edb.

Cico, O., Jaccheri, L., Nguyen-Duc, A., & Zhang, H. (2020). Exploring the intersection between software industry and Software Engineering education—A systematic mapping of Software Engineering Trends. Journal of Systems and Software, 110736. https://doi.org/10.1016/j.jss.2020.110736

Cristal, M., Wildt, D., & Prikladnicki, R. (2008). Usage of SCRUM Practices within a Global Company (p. 226). https://doi.org/10.1109/ICGSE.2008.34

Hidalgo, E. (2019). Adapting the scrum framework for agile project management in science: Case study of a distributed research initiative. Heliyon, 5(3), e01447. https://doi.org/10.1016/j.heliyon.2019.e01447

Kuz, A., Falco, M., & Giandini, R. (2018). Comprendiendo la Aplicabilidad de Scrum en el Aula: Herramientas y Ejemplos. Revista Iberoamericana de Tecnología en Educación y Educación en Tecnología, 21, 62–70. https://doi.org/10.24215/18509959.21.e07

Schwaber, K., & Sutherland, J. (2017). The Scrum Guide. The Definitive Guide to Scrum: The Rules of the Game. Scrum.org. https://www.scrumguides.org/docs/scrumguide/v2017/2017-Scrum-Guide-US.pdf#zoom=100

Ungvarsky, J. (2017). Scrum. En Salem Press Encyclopedia. Salem Press; ers. https://ezproxy.unbosque.edu.co/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=ers&AN=125600308&lang=es&scope=site

Vogelzang, J., Admiraal, W., & Van Driel, J. (2020). A teacher perspective on Scrum methodology in secondary chemistry education. Chemistry Education Research and Practice, 21(1), 237–249. https://doi.org/10.1039/C9RP00111E