In this issue:

The **Information Systems Education Journal** (ISEDJ) is a double-blind peer-reviewed academic journal published by **ISCAP** (Information Systems and Computing Academic Professionals). Publishing frequency is five times per year. The first year of publication was 2003.

ISEDJ is published online (https://isedj.org). Our sister publication, the Proceedings of the ISCAP Conference (https://iscap.us/proceedings) features all papers, abstracts, panels, workshops, and presentations from the conference.

The journal acceptance review process involves a minimum of three double-blind peer reviews, where both the reviewer is not aware of the identities of the authors and the authors are not aware of the identities of the reviewers. The initial reviews happen before the ISCAP conference. All papers, whether award-winners or not, are invited to resubmit for journal consideration after applying feedback from the Conference presentation. Award winning papers are assured of a publication slot; however, all re-submitted papers including award winners are subjected to a second round of three blind peer reviews to improve quality and make final accept/reject decisions. Those papers that are deemed of sufficient quality are accepted for publication in the ISEDJ journal. Currently the target acceptance rate for the journal is under 35%.

Information Systems Education Journal is pleased to be listed in the Cabell's Directory of Publishing Opportunities in Educational Technology and Library Science, in both the electronic and printed editions. Questions should be addressed to the editor at editor@isedj.org or the publisher at publisher@isedj.org. Special thanks to volunteer members of ISCAP who perform the editorial and review processes for ISEDJ.

# INFORMATION SYSTEMS EDUCATION JOURNAL

## Editors

*Teaching Case*

# The Agile Student Practice Project:
# Simulating an Agile Project in the Classroom
# for a Real-World Experience

David M. Woods
woodsdm2@miamioh.edu

Andrea Hulshult
hulshuar@miamioh.edu

Computer & Information Technology Department
Miami University Regionals
Hamilton, OH 45011, USA

## Abstract

In response to the adoption of Agile practices and processes by businesses, IT/IS educators are working to add Agile content to their courses. Teaching students about Agile involves teaching them about the history, mindset, and values of Agile, along with an introduction to the practices and processes used in an Agile product. Along with this, it is essential that students gain experience using Agile in a project setting. This paper discusses an Agile practice project where students use all aspects of Agile to address a problem and build a solution using Legos. The use of Legos, along with a project that students can easily see themselves using, the practice project allows students to focus on developing their Agile skills and mindset. The project serves as a useful transition from traditional classroom instruction about Agile to a project for a real-world client.

**Keywords:** Agile, active learning, collaboration, Agile project.

# The Agile Student Practice Project:
# Simulating an Agile Project in the Classroom
# for a Real-World Experience

*David M. Woods and Andrea Hulshult*

## 1. INTRODUCTION

Over the last decade, Agile emerged as a new organizational paradigm (Ahgina, De Smet, Lackey, Lurie, & Muraka, 2018) for organizations of all sizes across diverse sectors (Babik, 2022). ICAgile, an organization that supports learning and certification related to Agile, defines Agile as "a mindset that welcomes uncertainty, embraces challenges, empowers individuals, and views failure as a learning opportunity" (ICAgile, Mission, n.d.). The popularity of Agile emerged before the COVID-19 pandemic and continues to be an attractive solution to help organizations respond and adapt to change. The pandemic disrupted supply chains, retail markets, and even how people collaborate (from in the office to virtual) (Hulshult, A., & Krehbiel, T.C., 2021). We live in a Volatile, Uncertain, Complex, and Ambiguous (VUCA) world, which requires an approach that helps mitigate the chaos, stress, and anxiety that comes along with volatility, uncertainty, complexity, and ambiguity. The Agile mindset, principles, and practices welcome uncertainty, embrace challenges, and view failure as a learning opportunity (Hulshult, A., & Krehbiel, T.C., 2021).

To better prepare students for the Agile workforce, an IS/IT education program at a public university incorporated the Agile mindset and the Agile way of working into its curriculum. As part of its three-course Agile concentration, students gain Agile foundational knowledge and practical experience in applying Agile to the workplace. This three-course Agile concentration is also accredited by the International Consortium for Agile (ICAgile), and each course provides students with the opportunity to earn an ICAgile industry certification (Hulshult, A., & Woods, D., 2020).

The initial course in the sequence provides students with their first introduction to Agile. The initial part of the course discusses the history of Agile and the motivation behind it, introduces the idea of the Agile mindset, and introduces the main Agile principles and practices. In the later part of the course, students are broken into teams and complete a project for a real-world client that provides students with experience working with Agile.

Bridging the gap between these two parts of the course is a challenge. In the initial work, in-class activities are used to introduce students to specific Agile practices. However, these do not provide students with the experience and comfort level needed to work productively with the client at the start of the client project. An activity that will allow students to focus on using the Agile process to solve a problem while developing an Agile mindset, while limiting the effort students devote to understanding the problem they are solving and the tools used to build the solution is needed. While many instructors have written about activities they use to teach Agile, none of the published work fit this need, so a new Agile Practice Project activity was developed.

## 2. BACKGROUND

With the growth of interest in Agile, IT/IS educators have been working to develop and assess activities for teaching Agile concepts. Presenting activities that reinforce Agile and Scrum fundamentals can be challenging; however, research indicates that when Agile theory is combined with a hands-on activity, learning is more effective than just lecture or video alone. A literature survey located various classroom activities used to reinforce Agile and Scrum fundamentals and practices.

Valle and O'Mara (2015) developed an activity that teaches Agile fundamentals in undergraduate, graduate, and executive education project management courses to introduce participants to the fundamentals of Agile. Their activity divides students into teams and presents them with a project to work on, which involves completing different types of lists (such as listing the state capitals or famous people named "David," etc.). The teams work on completing these lists by working in sprints and using Scrum practices. This activity is a short activity with sprints lasting 2 minutes.

Sibona, Pourreza, and Hill (2018) conducted a study using two different approaches to teach

Agile and Scrum principles to business students. One lesson was lecture-focused, and the other activity-focused. Their research indicates that students' perception of Agile increased when they had the lecture and then the activity. For this activity, students are provided with origami paper and instructions. The students work in teams to follow the instructions. This activity is another short activity with 5-minute sprints.

In order to teach Scrum concepts to undergraduate students, Barcelos Bica and Silva (2020) use an activity to build a city with Lego blocks. Barcelos Bica and Silva use this Lego activity in a workshop format. Their research indicates that games and activities are more effective than theory or video lessons. This exercise is a longer activity, but students are provided user stories and other material to allow the activity to focus on the Agile development process.

In a first-year computing concepts course, Frydenberg, Yates, and Kukesh (2018) use a brief simulation game where students design, build, and test paper airplanes to introduce first-year computing students to agile principles and waterfall concepts. Students work in teams to experience both agile principles and waterfall concepts while designing and building paper airplanes. Their research indicates that this paper airplane simulation helps students learn the roles and approaches of both methods.

May, York, and Lending (2016) use the "Ball Game" in a Systems Analysis and Design course to help students experience the effects of a self-organizing Scrum team. The Ball Game is introduced after students learn about the Scrum framework. Besides helping students to experience a self-organizing team, the brief Ball Game activity also provides an opportunity to discuss other elements of the Scrum framework, such as agility, feedback, and estimation.

In a Systems Analysis and Design course, instructors use a simulated project over the course of the semester to learn Scrum principles and practices (Baham, 2019). For this Scrum project, students develop a working piece of software that integrates with a database. Weeks 8-16 of the course are where students work in two-week sprints to develop the project. This simulation helps students to gain real-world Scrum experience (Baham, 2019).

These are valuable activities to introduce various aspects of Agile that fall into two groups. One set is short activities that focus on introducing a small set of Agile practices in a single class meeting without requiring students to use technical skills such as programming. The other activities involve a longer project but require students to have significant technical skills (Baham, 2019; Babik, 2022) or focus on just the Agile development process (Barcelos Bica & Silva, 2020). Missing is an activity where students the full Agile planning and development process to complete a multi-week project without needing significant technical skills.

## 3. DESIGN

The Agile Practice Project (APP) activities were designed to connect the initial part of the course, where students were introduced to Agile, with the final part of the course, where students apply and develop their Agile skills and mindset by working on a client project. In the initial part of the course, students are introduced to the history of Agile, the Agile mindset, along with Agile practices and processes that support a customer focus, planning, delivery, leading, monitoring work, and delivering quality. These concepts are covered through lectures, small group discussions, and activities where students worked with individual Agile practices such as writing a focusing question, identifying user personas, documenting features using user stories, feature estimation and prioritization, release planning, acceptance criteria, and many more. Additionally, students are introduced to tools and techniques commonly used in Agile, including planning poker, social contracts, Kanban boards, and Trello. During the initial part of the course, the focus is on introducing individual concepts. While they are discussed as part of the overall Agile process, the main effort is for students to gain a basic understanding of each concept, with limited effort to connect all of the concepts as part of an overall project since this is one purpose of the client project.

During the final part of the course, student teams will work with a client to develop a product for the client. At the start of this project, the student teams must be ready to interact with the client to learn about the client's needs, document requirements for the client's product, and quickly deliver value. The APP is designed to give students experience working through an entire project using Agile to allow them to see how different Agile practices and processes are connected. Working through the entire Agile process in a practice project allows students a place to practice and refine their knowledge of Agile in a low-stakes environment. Students can then start the client project and focus more on

the client's needs with fewer concerns about their understanding of Agile practices.

Another consideration was to have an active learning activity in multiple senses of the word active. Ideally, the project would be hands-on and would get students out of their chairs and moving around in the classroom to bring energy to the activity. This would encourage interaction and collaboration between the students and support team building.

The use of Legos is an ideal solution for providing a hands-on project. Building with Legos gives students immediate satisfaction from seeing progress on the project. Additionally, the connections and interactions between the tasks individual students were working on would be easily visible, prompting communication and collective decision-making, which are key aspects of Agile teams. Lego kits also provide a varied but limited set of blocks, forcing teams to communicate and prioritize to share resources. A project that built a physical object would also simplify the Agile showcase that occurs at the end of each iteration and makes it easier for the instructor and other students to provide clear feedback.

A couple of constraints had to be addressed in designing the APP. The first constraint was time. While the APP was important in solidifying students' knowledge of Agile, giving students a start-to-finish view of an Agile project, and preparing them for the client project, the time allotted for the APP needed to fit into the overall schedule for the course. A second constraint was the knowledge and skills students could apply to the APP. Since the course is designed for first- or second-year IT students and was also open to students from all majors, the instructors could not expect students to have a consistent set of technical skills, for example, building with Lego blocks. A final consideration for the APP was choosing a project that students might use, making it easier for students to understand the customer's needs, identify requirements, etc.

To address these requirements and constraints, the APP is based on a fictional news release that a recent survey shows that local residents and students report a need for a family-oriented entertainment center in the area. As local residents and consumers of entertainment, students will be users of this product, so they should be able to propose features for a solution and document how features will provide business value. To address the skills concern and the limited time frame, students will implement their solutions using Legos. For online courses, online, multi-user design tools such as TinkerCad or Minecraft can be used.

## 4. IMPLEMENTATION

The Agile Practice Project starts by sharing a fictional news release (see Appendix A) with the teams. Teams are told that they will design a product to meet these needs and will then build it using Legos. After an initial discussion of the project, teams used Agile practices to work through the concept and initiate phases of the project. The main activities and the timebox set for each activity are listed in Appendix B. A presentation (available as teaching notes) is used to support the activities. For each activity, a slide states the activity's timebox and what teams need to work on. For each activity, a couple of slides are also included to provide a quick review of content relevant to the task.

While the teams work on each item, the instructor circulates amongst the teams to listen in on their discussions and provide coaching as needed. After each timeboxed activity, there is a short class discussion. One team may be asked to share their work, the instructor may share comments based on individual team discussions they heard, or teams may ask questions.

The team starts by developing ideas for the product. Each team member provides one or more ideas written on Post-it notes. Next, the teams select one idea as their product using techniques such as horse racing, introduced earlier in the semester. As part of this process, teams are encouraged to check whether they are happy with the selected idea and, if not, to do more brainstorming. Once the team has settled on a project idea, the team member who contributed the idea is identified as the customer for the team's project and will fill this role, with assistance from the instructor for the rest of the project.

After identifying a project idea, the teams create a focusing question to focus the team on a common objective. After the focus question has been written, each team works with their customer to sketch out a high-level solution on the team's whiteboard and also creates a list of the product's main features. These sketches and lists were saved so that teams could refer back to them throughout the project. This step also allowed the instructor to reinforce the Agile practice of information radiators.

At this point, each team had a concept for their

final product. During the next time box, the teams worked to identify constraints, such as time, Lego building skills, etc., that would help them prioritize the features of their product. The teams then worked with their customer to identify the minimal marketable product (MMP) that would deliver value within the constraints. Teams then considered whether their product was feasible – could they build their MMP within the constraints? As this was a learning project, teams discussed this point, but all teams were expected to continue with the project.

Teams next moved into the initiate phase of the Agile project, where the initial concept for the solution is refined, requirements are documented as user stories, and the stories are sized and prioritized. To support these activities, teams created user personas during the first time box in the initiate phase. Personas document the role of different groups of users, how they will use the final product, and how the product adds value to a person in this group. Teams are expected to identify and document three to five personas for their product.

Once the team has created user personas, they move to the next time box, where they write user stories to document the requirements for their product. The user stories used a common format – "As a [role], I want to [do something], So I can [achieve outcome or value]." This process was iterative. Initially, individual team members wrote user stories, then the team collaborated to combine similar stories and split large stories into smaller stories. Teams also checked that they had written user stories from the perspectives of all the personas they had identified. Finally, teams worked with the customer to review the high-level solution to ensure the user stories covered all the previously identified features and wrote additional stories as needed. Also, as user stories were revised and refined, the teams worked to capture acceptance criteria to define how they would know that a given story was complete.

At this point, the teams had a reasonably complete set of user stories for their product. In the next time block, the teams worked with their customer to prioritize the stories based on the business value using the MoSCoW (Must, Should, Could, and Won't) method (Moscow, n.d.). The prioritization process was often iterative, with teams reviewing the number of stories in each category and revising their prioritization as needed to ensure that too many stories were not prioritized as must-haves.

After prioritizing the user stories, the teams worked on estimating the work needed to build each story. Teams were reminded that the work to build a story should also include the work required to test the feature. Estimation was done by having the team agree on what they felt was the smallest story and then estimating the work for other stories relative to this story. Teams could use either story points based on the Fibonacci series (1, 2, 3, 5, 8, 13, etc.) or t-shirt sizes (S, M, L, XL, etc.). Teams estimated their "Must do" stories first, followed by "Should do" and "could do" stories to ensure that the highest priority stories were sized by the end of the time block.

Now, the teams are ready to organize their user stories into releases. At this point, teams created Agile Kanban boards with columns for release 0 and future releases. Teams were told they would have ten minutes to work on a Release 0 product and worked with the customer to identify which stories should be in the backlog for this release. The small amount of time allocated for release 0 was designed to ensure that the teams could quickly see the entire Agile iterative process of planning work, doing the work, and then showing the customer the completed work.

The teams then spent 10 minutes working on their release 0 product. "Doing" and "Done" columns were added to the team Kanban boards, and individual team members moved user stories from the release backlog to the "Doing" column, built part of the product, and then moved the user story to the "Done" column. At the end of the iteration, teams demonstrated their product to their customer, received feedback from the customer, and celebrated the accomplishments of the first iteration. After this, the team completed a retrospective on the iteration by discussing what went well, what could have gone better, and identifying ways to make improvements.

After completing the work for release 0, teams completed two more releases using the Agile iterative cycle of planning the work, doing the work, showcasing the work to the customer, and doing a team retrospective. After the second of these iterations, the teams also showcased their work to the entire class. The time allocated to each of these iterations is adjusted based on the class schedule but typically is most of an eighty-minute class meeting. During these iterations, the instructor continued circulating amongst the teams to offer suggestions and coaching. Where appropriate, for example, if several teams were experiencing the same issue, the instructor would interrupt the teams' work for a short discussion with the entire class.

Initially, the Agile Practice Project was assessed based on student participation. Students earned points equal to approximately 1 % of the course grade for participating in the practice project. Recently, two additional assignments have been added to the Agile practice project. One assignment is an online discussion where one member from each team posted their team's product idea, focusing statement, and at least two personas that the team identified. All students then read the team posts and made at least two replies to provide constructive feedback to other teams. Since all the teams are working on the same project, this activity lets students see what the other teams developed and compare and contrast them to their team's work. This assignment was completed when the teams had finished the planning work and were ready to move into the building iterations – typically at the end of the first day of the project. The second assignment that has been added is completed at the end of the project. The assignment is another online discussion, with each team having a separate discussion forum. In this discussion, each team member posts a retrospective on the team's work – what went well, what could have gone better, and any questions – along with a retrospective on their individual contributions to the team's work. Each student must read all the posts and reply to at least two of their teammates, commenting on what the person did well and providing constructive feedback. The two additional assignments are worth approximately 1 % of the total course grade.

## 5. DISCUSSION

The Agile Practice Project has been successfully used in over a dozen class sections of an introductory Agile course over the past few years, including both in-person and synchronous online format class meetings. The course is required for all IT majors who typically take it at the end of their first year or the beginning of their second year. The course has no prerequisites, so students from majors outside of IT regularly enroll in the course. Students who successfully complete the course earn the ICAgile ICP Agile Fundamentals certification (ICAgile, Certification, n.d.).

In this context, success means that students gained experience working with Agile practices and processes, and the teams successfully built a product they could showcase at the end of the practice project. Appendix C contains photos of actual student projects from two different course sections showing work in progress during the project. While the teams successfully completed

the project, as expected, they faced challenges along the way that provided opportunities for the instructor to coach the teams in using Agile processes and practices and developing the Agile mindset. One reason that teams struggled was the short time frame of the project. Some teams would go into too much detail, and the instructor would need to prompt them to focus on delivering value for the client. For example, one team was discussing whether the parking area at their venue should be gravel or paved. The instructor prompted them to think about why they were adding a parking area, leading the team to realize that it was more important to focus on matching the size of the parking area to the number of people expected to use the venue.

Another area where instructors provided significant coaching was teamwork. Since students had limited previous experience with team projects, this was expected. During the initial project activities, the tasks were clearly defined, and supporting material was presented to remind students of previous discussions related to each task. However, some teams struggled to get started, with team members waiting for someone else to show initiative. A quick visit from the instructor to ask a simple prompting question was usually enough to get the team started. Some teams struggled to form and get organized during the short length of the practice project. For these teams, the instructor worked with the team during their end-of-project retrospective to identify actions they could take to improve team communication and interactions, and these were then used to help the team write a social contract during the beginning of the client project that followed the practice project.

An additional observation is that the students are very eager to get ahold of the Legos and start building. It is important that the instructor show the teams the Lego kits to let the teams know what resources are available for the project work. However, the instructor needs to review each team's work before allowing the team to start working with the Legos.

Several themes were found in the retrospectives students submitted at the end of the project. First, students felt that the practice project helped them better understand the Agile practices and processes covered in the first part of the course. Students also noted that completing the practice project made them feel better prepared for the client project they would complete during the second half of the course. Finally, some students noted that the practice project felt rushed, which was not surprising given the design tradeoffs

discussed above.

The instructors currently using the Agile practice project do regular retrospectives to assess the project and determine what is working well and where there may be opportunities to improve or clarify the project. These retrospectives led to the development of additional assignments during the project. Other ideas currently being explored include investigating other tools to support the use of the Agile practice project in fully online course sections.

## 6. CONCLUSION

The Agile practice project provides students useful experience working with Agile after being introduced to Agile practices and processes in a traditional classroom setting. The practice project provides students with a low-stakes way to gain experience with Agile and build confidence in preparation for using Agile to work on a project with a real-world client. Utilizing Legos or an online building tool allows students to focus solely on the practice of using Agile processes to solve a problem rather than worrying about the specific skills needed for every task. Additionally, using a project scenario that students can envision using allows students to fully engage with the use of Agile practices and processes to define the scope and requirements for the project. Finally, the project helps students start developing an Agile mindset, which employers often mention as the most important thing they look for when interviewing candidates for positions in an Agile team environment.

## 7. REFERENCES

Ahgina, W., De Smet, A., Lackey, G., Lurie, M., & Muraka, M. (2018). The Five Trademarks of Agile Organizations. Retrieved on May 9, 2019, from https://www.mckinsey.com/business-functions/organization/our-insights/the-five-trademarks-of-agile-organizations/

Babik, D. (2022). Teaching Tip: Scrum Boot Camp: Introducing Students to Agile System Development. Journal of Information Systems Education, 33(3), 195-208

Baham, C. (2019). Implementing Scrum Wholesale in the Classroom. Journal of Information Systems Education, 30(3), 141-159.

Barcelos Bica, D. A., & Silva, C. A. G. d. (2020). Learning Process of Agile Scrum Methodology With Lego Blocks in Interactive Academic Games: Viewpoint of Students. IEEE Revista Iberoamericana de Tecnologias Del Aprendizaje, Tecnologias Del Aprendizaje, IEEE Revista Iberoamericana de, IEEE R. Iberoamericana Tecnologias Aprendizaje, 15(2), 95–104. http://doi.org/10.1109/RITA.2020.2987721

Frydenberg, M., Yates, D. J., & Kukesh, J. S. (2018). Sprint, Then Fly: Teaching Agile Methodologies with Paper Airplanes. Information Systems Education Journal, 16(5), 22–36.

Hulshult, A. & Krehbiel, T.C. (2021). The need for Agility in a VUCA pandemic world. American Journal of Business, 36 (2), 105-108. https://doi.org/10.1108/AJB-06-2021-143

Hulshult, A., & Woods, D. (2020). Applying Agile across the IT curriculum. Information Systems Education Journal, 18(1), 14-21.

ICAgile (n.d.). Agile Fundamentals Certification. Retrieved June 9, 2023, from https://www.icagile.com/certification/agile-fundamentals

ICAgile (n.d.). Mission. Retrieved June 9, 2023, from https://www.icagile.com/about-us

May, J., York, J., & Lending, D. (2016). Play Ball: Bringing Scrum into the classroom. Journal of Information Systems Education, 27(2), 87-92.

MoSCoW Prioritization (n.d.). Retrieved June 9, 2023, from https://en.wikipedia.org/wiki/MoSCoW_method

Sibona, C., Pourreza, S., & Hill, S. (2018). Origami: An Active Learning Exercise for Scrum Project Management. Journal of Information Systems Education, 29(2), 105–116.

Valle, M., & O'Mara, K. J. (2015). Adaptive Project Management: A Classroom Exercise to Explore the Fundamentals of Agile (Scrum). Journal of the Academy of Business Education, 16, 257–275.

**Editor's Note:**

*This paper was selected for inclusion in the journal as the 2023 ISCAP Conference Best Teaching Case The acceptance rate is typically 2% for this category of paper based on blind reviews from six or more peers including three or more former best papers authors who did not submit a paper in 2023.*

**APPENDIX A**

**News release used to introduce the Agile Practice Project**


Project News Release


The Chamber of Commerce has commissioned and released findings of a recent survey showing that area residents and local college students alike are looking for an alternative venue for outdoor fun and entertainment. 88% of residents and 65% of college students reported that they would welcome new sources of "good clean fun" in the area.

In response to the survey, Fun Ventures LLC has formed with the goal of building a family-oriented entertainment center in the area. The entertainment center will cater to groups seeking a fun and family-oriented small-scale park. Customers include businesses, school groups, church groups, sororities and fraternities, social groups, and other organizations looking for a venue to hold group outings. The center could be open to the public on a limited basis as well.

**APPENDIX B**

**Activities and Time Allocated for concept and initiate phases of the project**

| Task | Time Block | Activities |
|---|---|---|
| Team Ideation | 5 minutes | Brainstorm ideas |
| Select Idea | 10 minutes | Use the horse race technique to select one idea |
| Identify Customer | 1 minute | Team member who provided the selected idea is identified as the customer |
| Focusing question and high-level solution | 10 minutes | Develop the focusing question for the project and sketch the team's planned solution |
| Minimal Marketable Product (MMP) | 10 minutes | Determine the team's MMP and identify project constraints |
| Personas | 10 minutes | Document personas (role, profile, and goal) for the product. |
| User Stories | 10 minutes | Write user stories to document feature requests |
| Review user stories | 5 minutes | Merge similar stories, split large stories, etc. |
| Prioritize user stories | 10 minutes | Prioritize stories using MoSCoW method. |
| Story estimation | 15 minutes | Estimate story sizes using planning poker or t-shirt sizes |
| Release planning | 5 minutes | Group stories into release 0 and future releases |
| Iteration 0 | 10 minutes | Build features for release 0 |
| Showcase 0 | 3 minutes per team | Showcase features built in release 0 |
| Retrospective 0 | 5 minutes | Complete team retrospective |

**APPENDIX C**

**Photos of student work product for the Agile Practice Project**