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Agile Learning in Action: Fostering Students' Agile Mindsets and Experience with a Classroom Client Project

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Abstract

IT/IS educators continue to work to develop content and activities for teaching Agile practices, processes, and methodologies to their courses to ensure students have the skills expected by businesses. Given the wide range of tools and technologies that fall under the umbrella of Agile and the wide range of places where Agile is applied, educators face a daunting task. Since Agile is a methodology for completing projects in a changing environment, providing students with real-world experience using Agile is essential. This work presents an activity that uses a real-world client project to allow students to gain experience with Agile practices and projects while also working to develop and use an Agile mindset.

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

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Agile Learning in Action: Fostering Students' Agile Mindsets and Experience with a Classroom Client Project

David M. Woods and Andrea Hulshult

1. INTRODUCTION

As the use of Agile methodologies by software developers, IT professionals, and others continues to grow, IT educators are bringing Agile into the classroom (Digital.ai, 2024; Krehbiel et al., 2017). The growing use of Agile is also leading to discussions about the challenges of adopting and scaling Agile. Bryar and Carr (2021) ask "Have we taken Agile Too Far?" and discuss concerns that organizations are using Agile without enough consideration about whether it is appropriate for their circumstances. Similarly, the 17th State of Agile report notes that "At this moment in time, it feels like Agile is having difficulty adapting." (Digital.ai, 2024). Despite these concerns, discussions with employers continue to support the value in teaching our students about Agile.

Agile is a methodology for doing work and building products, so, naturally, IT/IS classes teaching Agile should have a project component where students use and develop their Agile skills. Additionally, since a key part of being a successful Agile practitioner is developing an Agile mindset that "welcomes uncertainty, embraces challenges, empowers individuals, and views failure as a learning opportunity" (ICAgile, n.d.), the project component must include an environment that promotes the development of this mindset. This paper describes a class project where students spend several weeks using Agile methods and practices to complete a project for a real-world client.

This client project is used in a course that all IT majors are required to take. The class is accredited by the International Consortium for Agile (ICAgile), and students who complete the class earn the ICAgile Agile Fundamentals Certification. The class is a prerequisite for two additional elective Agile courses. IT students typically take the class at the end of their first year or the beginning of their second year. The class is open to students from all majors and regularly enrolls non-IT students. The course does not focus on a specific methodology or flavor but rather focuses on the development of an Agile mindset. The course starts with a discussion of the history of Agile and the Agile mindset, and it

provides an overview of the main Agile practices and processes and how they fit into the iterative Agile development process. Throughout this part of the course, students are introduced to a variety of Agile tools, practices, and methods that the instructors feel are appropriate for students at the beginning of their Agile journey. After this initial lecture and discussion-based phase of the course, students complete a short practice project using Legos (Woods & Hulshult, 2024). The remaining six to eight weeks of the course are then spent on the client project.

2. MOTIVATION

It is a common practice for the technologies and practices used by working IT/IS professionals to drive changes to the content taught in IT/IS programs. Hence, as organizations continue to adopt Agile methodologies, IT/IS educators are working to bring Agile into the IT/IS curriculum. As noted by Reed and Killingworth (2024), "it is important to educate Information Systems (IS) project managers in a way that prepares them to use their new skillset in the workplace immediately." This supports teaching Agile using both traditional teaching methods to provide foundational knowledge and hands-on activities that allow students to gain experience working with Agile and develop an Agile mindset.

Previous work (Woods & Hulshult, 2024) discusses a short practice project that can be used to provide students with initial experience using Agile and also provides a review of other activities and approaches that have been developed for teaching Agile. While there are several useful activities for teaching Agile, many are short, focusing on a particular aspect of Agile or using a simulated project that provides fewer opportunities for students to encounter the uncertainty and ambiguity present when working with a real client. An additional consideration for a longer Agile project activity is the level of the student's technical skills. There are longer project activities (Babik, 2022; Baham, 2019), but the expected level of student technical skills would limit these to upper-level students, delaying the introduction of Agile until late in the curriculum.

3. DESIGN

The main goal of the client project is for students to gain experience working with Agile and begin developing an Agile mindset. The project has several constraints. The primary constraint is the limited time available for the project. In a typical semester, the classwork needed to provide students with an introduction to Agile will take about half of the semester. It is also helpful to do a short practice project to allow students to get more comfortable before they work on an actual client project, leaving 6 - 8 weeks for the client project. Another constraint is that the students are new to Agile. In a professional setting, Agile teams typically have a mix of experience levels, allowing the more experienced members to provide leadership on the more complex aspects of Agile, such as estimating, coaching the team, and interacting with the client. A final constraint that must be considered is the students' technical skills. The typical student in the course is an IT major in their first or second year of study, but the course is open to all majors. These factors mean that the students in the course often have limited technical skills.

To address the constraints, we decided to be realistic about our goals for having students gain experience with Agile and focus on ensuring that students gained experience with a limited set of Agile practices and processes while still seeing all aspects of an Agile project. Based on discussions with local companies and Agile professionals, one of the main goals was to provide students with the opportunity to develop aspects of the Agile mindset, including learning and discovering quickly, prioritizing to deliver customer value quickly, continuous inspection and feedback, and the value of self-directed teams.

To support the detailed goals of promoting an Agile mindset and having students gain experience with basic Agile practices and processes, we decided to structure the client project with a focus on the iterative Agile development cycle of planning, development, showcase, and retrospective. The project would also include the initial planning, especially writing user stories to document client requirements. However, given the lack of prior experience with Agile, we decided that the planning would focus most on documenting how the user stories provided value to the customer and prioritizing the user stories. While students would do other aspects of planning, including estimating and release planning, we expected these to be more challenging for students.

During the project iterations, the focus would be on having students work on the project and use the project storyboard to track progress on the iteration. Typically, the project uses two-week iterations, resulting in three or four iterations. Daily standup meetings were used to promote team communication and offer students an opportunity to gain experience in the Agile coach role. It was also important to focus on the showcase and retrospective activities of the iteration to give students experience discussing the value of their work with the client, receiving feedback from the client, and engaging in retrospectives to provide an opportunity to improve their teams.

Less emphasis was placed on iteration planning due to expected challenges with estimating. The main focus of planning was to ensure that the user stories brought into the iteration were well prepared, had defined acceptance criteria, and would be a reasonable amount of work for the team to complete during the iteration. The project was also designed with the expectation that the instructor would fill the Agile coach and business product owner roles as needed.

4. IMPLEMENTATION

The implementation of the project design was divided into two parts. The first part involved the initial project initiation activities, including the project kickoff meeting with the client, team building, project conceptualization, project initialization, and planning for the first iteration. The second part involved the iterative work to build the project, which typically consisted of three to four two-week iterations, with students showcasing their work to the client at the end of each iteration.

Two groups of assignments were used to assess the team and individual student work during the client project. One group consisted of assignments where submissions were made by the team, and with a few exceptions, all team members received the same score. The assignments in this group consisted of a project kickoff assignment and showcase assignments for each iteration. The assignments in this group counted for 30% of the overall course grade.

The second group of assignments were individual assignments designed to allow students to show their individual contributions and their progress using Agile practices and processes and the Agile mindset. Students submitted a written assignment reflecting on their accomplishments at the end of each iteration. For these

assignments, students were prompted to discuss their individual contributions during the iteration, the value of these contributions, how Agile practices and processes were used, and how the Agile mindset was used. Students were also asked to identify at least one other team member who made particularly valuable or helpful contributions during the iteration and explain why the contributions were valuable. The assignment instructions also set the expectation that the discussion would be in a narrative format, well-written, and organized. The instructions stressed that the student needed to be specific and demonstrate the impact of their efforts. A minimum page length was not specified, but the instructions noted that it was unlikely that a page or two would adequately demonstrate the students' efforts. The individual accomplishments assignments at the end of each iteration were 20% of the overall course grade.

At the end of the course, students also completed an individual reflection and individual accomplishment paper that covered the entire course. This assignment counted for 20% of the overall course grade and asked students to discuss five separate areas. First, students were asked to bring in their individual accomplishments documents from each of the iterations and revise these documents based on the feedback provided by the instructor. Next, students wrote an individual accomplishment reflection for the final iteration. In the third section, students were asked to summarize and highlight one to three of their most valuable or noteworthy contributions to the team project. After this, students reflected on the course learning outcomes (See Appendix A) and discussed how their learning in the course connected to each learning outcome. Finally, students discussed one teammate whose overall contributions during the project were most valuable and explained how these contributions provided value to the team.

Project teams completed an extensive set of activities to initiate the project. These are discussed in detail in Appendix B. The project started with a project kickoff and a client meeting. Next, the teams completed teambuilding activities, including setting up the team's infrastructure for the project and naming the team. After this, the teams worked on activities to build a conceptual understanding of the client's request. This included writing a focusing statement, discussing initial project ideas, and identifying a minimal viable product (MVP). Finally, the teams initiated their work project development and prepared for the first iteration by developing user personas and documenting

client requirements by writing user stories. The user stories were then prioritized and sized, and work for the first iteration was identified and documented on each team's project storyboard.

During the iterations, teams worked to develop and test solutions for the user stories allocated to the iteration. At the end of each iteration, the client joined the class for a session where each team made a 7 - 10 minute presentation about the work completed during the iteration, including a demonstration of the product they were building. The showcase also included time for the client to provide feedback and teams to ask questions about upcoming iterations. After the showcase, each team completed a retrospective discussion of what went well during the iteration and what could be improved and used this to identify any changes to how the team works for the next iteration. Finally, the team identified the user stories for the next iteration, which often included adding new stories or revising existing stories based on feedback from the client.

5. DISCUSSION

Several different instructors have used this client project approach over several years. During this time, several lessons have been learned. As expected with Agile, the instructor's approach to the client project has evolved to incorporate the experience of previous semesters.

A key part of a successful experience for the students is the selection of the client and the project. The instructor must start lining up a client and project a few months before the class begins. It is important for the instructor and client to establish a good relationship and for the instructor to ensure that the client is comfortable with the Agile approach, will be readily available to answer questions and provide information, and understands that the results of a student project can be unpredictable. As discussed in the design section, it is helpful if the project is one that students can easily understand and, ideally, one where students would be users of the product developed by the project.

It is also helpful if the technology used to build the project is one students are familiar with or can quickly learn. In our case, students are in their first or second year of study in an IT program, but they can also be students from other majors, so teams often have limited technical skills. Projects that involve developing content for a website implemented using Google Sites, WordPress, or other easy-to-learn tools have worked well.

In the real world, an Agile team will have members with previous experience using Agile. When someone new to Agile joins the team, they can learn from their teammates and adopt the Agile practices and processes already used by the team. Instructors in a classroom setting face the challenge of working with newly formed teams where all of the team members have no previous experience with Agile. To address this, the instructor must constantly monitor the teams and step in to provide coaching and feedback when needed. The instructor will also need to be familiar with the client's expectations for the project so they can fill the Agile business product owner role when needed.

Sample Projects

We offer examples of projects we have used in past semesters to help readers understand how they might implement this approach to an Agile client project. Several examples involve students building websites. One example was building a site with content focused on using Agile in teaching. The client was the university's Center for Teaching Excellence, where the instructor had a long-term relationship with the center and its staff. The instructor also had extensive experience using Agile in their teaching, so they could guide students in selecting the content developed for the site. The content also overlapped with the course content the students were learning, allowing them to think about how Agile concepts could benefit students in a course.

Several projects were connected to a campus-wide focus on student retention. For these projects, the client was the assistant dean for student and academic success, who was also the leader of the team exploring issues and ideas for improving student retention. The first student project was motivated by research showing that student engagement outside the classroom was the most important predictor of student retention. This focus was intentionally broad and allowed the student teams in the course to develop their own ideas. Retention team members were invited to all the showcase events and found it very useful to learn what students thought would help them be more engaged outside the classroom. Two groups explored the use of Discord, with one group looking at how Discord could be used for informal class discussions, tutoring, and other academic-related uses. The other group explored the use of Discord for student events and other non-academic uses. Another group explored using an education-focused online virtual environment for academic and non-academic uses. A final group explored ideas for a virtual major fair and a student-focused website

containing the information students needed to successfully navigate tasks, including course registration, finding student services, and campus maps. The student-focused website prompted significant discussion, with all the students in the class agreeing that they struggled to find the information they needed on the university's website.

The retention team was very interested in the student-focused website idea, so a later class did this as a project using Google Sites as the hosting platform. This generated much discussion with the student teams. The retention team was especially interested in seeing what information students thought was important and how content written from a student perspective - the perspective of the people actually using the resources, differed from how the same content was written by the professionals providing the services. There was also much interest in the videos created by the student teams, which showed the influences of TikTok, with short, casual videos rather than the longer, more professional, and dull format used on the university website. The result of this project was that the campus web content team decided to implement the idea of a student-focused website. This led to yet another iteration of the project idea using the campus WordPress platform along with a focus on creating a consistent set of video content.

Challenges

The Agile client project can be challenging due to the uncertainties of working with a real client and the fact that the students are new to Agile. One issue is that in discussions and written work, students will focus on what they did rather than why they did it. For example, a student will discuss the details of content they added to a website. This is good, but more is needed. Agile focuses on delivering value to the client, so students must also discuss why what they did has value to the client. For most students, this improves as they receive feedback from the instructor.

Another issue is with the Agile practice of limiting the work an individual team member is responsible for at a given time. In an Agile iteration, the team commits to completing a set of user stories. During the iteration, a team member will take ownership of a story and complete that story before taking ownership of another story. Some students will want to be told what to do rather than picking their own work. Also, some teams will select a leader to assign work to team members. The instructor will need

to watch for these practices. A key to addressing these issues is ensuring that teams create and regularly maintain an Agile storyboard showing the status, including ownership of the stories a team is working on during an iteration. We require that all project teams use Trello to create Agile storyboards and that the instructor have full access to the team's storyboard. This allows the instructor to regularly review the storyboard to ensure that stories are moving from a to-do status to a doing status and then to a done status. Instructors also look to see that a team member owns all stories in the doing or done status and that team members are not working on too many stories at once. Trello also allows the instructor to see whether all students are engaged in maintaining the storyboard rather than having one person assign and update stories. With coaching and prompting from the instructor, this issue can usually be resolved during the initial iteration. However, it should be noted that some students do not get out of the mindset of expecting someone else to tell them what to do.

Many of the student issues seen in the class are related to the course's fundamental goal of having students develop an Agile mindset. Students cannot be given a set of steps for doing this. Instead, the client project is an activity designed to prompt the development of this mindset. Much of the instructor's work during the project is prompting students to think about how to do things using an Agile method and coaching them as needed with ideas on how to do this. We have noticed that developing an Agile mindset can be more difficult for first-year students who are also working to shift from a high school mindset, where they are provided more structure and direction, to a college mindset that requires more student initiative and organization. To address this concern, we recently added our university's required first-year English composition course as a prerequisite for the Agile course.

Use of AI

With the rapid expansion of AI, especially generative AI, we are seeing student use of AI in this course. We find that with the client's approval and the instructor's guidance, using AI to help build the client's product can be helpful. Students are expected to understand the limitations of AI and take responsibility for all of the content included in the project, for example, making sure that AI-generated content is correct and relevant to the project. With these limits, students have made good use of AI. For example, careful use of AI can help ensure that all of the content on a website has a consistent voice.

It appears that students are also using AI to complete the assignments required as part of the client project. There is no way to confirm this, but some student submissions show the hallmarks of AI. This use of AI has not been successful, especially for the individual accomplishment assignments. These assignments require students to discuss what they did during an iteration and why this has value. Students must also discuss how they used Agile practices and processes and demonstrated the Agile mindset. The suspected AI submissions are well-written but are very high-level discussions lacking the details needed to support the statements about what a student did or how they used Agile. They also tend to be very generic; for example, in the website building projects, some submissions would discuss implementing a login or building software for a web application when there was no login and the project used a content system like Google Sites or WordPress.

6. CONCLUSION

This activity allows students to practice using Agile practices and processes and develop an Agile mindset in a real-world setting, where they can experience the uncertainty and ambiguity they will encounter when using Agile in a professional setting. Over several years, the use of this activity has shown that it can be effective, but it also has challenges. An instructor with experience in the Agile coach role and previous experience with client projects can overcome many of these challenges.

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APPENDIX A

Course Learning Outcomes

At the end of the course, students will be able to:

1. Describe the history and mindset of Agile
2. Describe and apply Agile practices that facilitate effective communication and Agile values
3. Describe and apply Agile practices that facilitate effective customer interaction in order to control risks and adapt to change in product development
4. Describe and apply practices that help the team to quickly deliver products that are of value to the customer
5. Describe and apply Agile practices that help the team to plan, monitor, and improve their way of working.
6. Describe and apply Agile practices and mindset to the course project within a team environment.

APPENDIX B

Details of Project Initiation Activities

Project Kickoff

The main purpose of the project kickoff is to provide a launching point for the project and the student teams. The project kick-off introduces the client and the students and provides students with the opportunity to hear about the customer's goals and needs from the customer's perspective. A large portion of the project kick-off involves assisting the student teams in team-building activities to get organized and bond as a team. The project kick-off allows student teams to learn concepts for solution ideation and develop possible solutions for the client's problem. This ideation session leads to a preliminary list of tasks and a project schedule to help the teams get started.

Client Kickoff

The client kickoff meeting occurs early in the project, usually before students begin to work on the project, so the students can meet the client and discuss the project. This meeting can be held in person or virtually. The authors suggest that the course instructor provide the client with a list of meeting dates early on in the project or even before the academic session begins. The authors of this paper find a client the academic session before the course is to be taught so dates for meetings can be determined and booked on calendars. It is recommended that dates be set for the client kickoff meeting, two or three check-in points, and the final project presentation.

Teambuilding

After the project is kicked off, the project teams progress through a series of team-building activities to encourage team bonding and accountability. The first team-building exercise is creating a social contract for each student team. Social contracts can be written on a virtual document or a physical piece of paper. A social contract is a set of rules a team develops together that govern how their team works above and beyond their project tasks. While there is no defined set of questions for developing a social contract, questions that can get teams thinking about their governance include: What do we value as a team (e.g., accountability, being on time, listening, etc.)? How will we handle conflict? How will we run our meetings? How will we manage our work? How will we know if we are successful? How will we have fun? As a team develops a social contract, they learn more about each other and create shared expectations for how they want to work as a team. According to the Agile Academy (2018), the benefits of a social contract are that (1) teams need to own their practices and standards to have a commitment to them; (2) it contributes to a safe working environment, giving people the power to have conversations about behaviors considered inappropriate; and (3), it helps build the unique character of the team and creates a shared sense of identity. As the class and project progress, the team can refer back to the social contract if behaviors arise that are addressed in the social contract (Hulshult & Krehbiel, 2019).

Infrastructure

The next team-building activity is discussing and outlining the team's infrastructure from a functional perspective. Each team discusses where they will store their files, create any necessary file structure, and ensure all team members have access. Teams create a storyboard to manage their work. The authors recommend using the platform Trello for storyboards. Other infrastructure items include discussing any specific team roles and responsibilities. The infrastructure activity aims to ensure that each team has the tools to do its work.

Team Names

The last team building activity is for each team to develop a team name, which helps to create their identity as a team.

Concept Activities

Concept activities assist teams in developing an initial solution for the client project. The three concept activities used in the Agile Client Project are the focusing statement, developing initial product ideas, and outlining the Minimal Viable Product (MVP).

Focusing Statement

The focusing statement helps teams have a shared understanding of their focus. Focusing statements help teams to stay on track and remember what they are supposed to be developing. If the team is

discussing if they should do something or not, they should refer to the focusing statement so they do not end up doing work that is not necessary. Focusing statements also help a team remain focused on completing the project rather than going in a different direction. A simple template for a focusing statement is: "How can <our team> create/solve <product/problem> for <client> so that <benefit for client> while <how benefits are achieved>". It is helpful if each team shares its focusing statement with the client to obtain feedback. The team should keep this document in their team folders where it is readily accessible.

Initial Product Ideas

Once the focusing statement is completed, each team starts ideating initial solutions to the client's problem or project. One effective technique for ideating initial solutions is to have each team member write one or more ideas on Post-it notes. There should be one idea per Post-it note. Next, the teams select one idea as their product using techniques such as horse racing or an Agile lean coffee introduced earlier in the semester. Both of these ideation approaches help teams come to a shared understanding of what their solution is going to be.

After identifying a project idea to proceed with, the teams should check the idea against their focusing statement to ensure the idea aligns with their project mission. After the focusing statement has been reviewed, each team sketches out a high-level solution and 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.

Minimal Viable Product

The Minimal Viable Product, or MVP, is an agile concept that helps teams create a first cut of the project that contains the most important features. The solution's most important features are developed first, and this becomes the MVP. The MVP is the smallest viable product, and because it contains a small set of features, it can be launched quickly and additional features added in the future (Abbott et al., 2022).

Initiate Activities

The initiate phase of the Agile process contains several activities that assist teams in developing tangible work items for project completion: personas, prioritization, and sizing. After completing these activities, teams have a solid outline of the work at hand and the priority for completion.

Personas

In Agile, personas are fictional characters created to represent different user types that might interact with a product or project. These personas represent the target audience and help teams understand and empathize with the client's needs, goals, behaviors, and challenges and ensure their work meets those needs.

User Stories

User stories, sometimes called story cards, are an Agile practice teams use to represent requirements for a project, and they are displayed on a physical or virtual Kanban board. A collective group of user stories defines the project requirements and maps out the work that needs to be completed. A user story contains a sentence or two that describes a necessary function or requirement for a project (LeanDog, 2012). User stories contain criteria that must be met for the story to be marked "complete," and user stories are verifiable, meaning the work outlined on the user story can be validated or tested. User stories can be written on index cards and attached to a whiteboard or created and managed virtually on a storyboard using a platform such as Trello. This helps track the progress of projects because team members can assign story cards to themselves and take accountability for the work. User stories also allow instructors to see the progression of a team's work and allow for instructor intervention and support.

Prioritization

After students develop a backlog of user stories for their project, they need a democratic way to prioritize the work and determine which user stories should be completed first. The goal of prioritizing user stories is to build the MVP. Student teams should ask themselves, "What user stories must we complete first to build the MVP?" MoSCoW is a prioritization technique Agile teams use to prioritize their user stories. All user stories are put into one of four categories: Must have (M), Should have (S), Could have (C), and Won't have (W) (Krehbiel et al., 2017). Students can discuss the user stories and mark each one with an "M" if the requirement is a "Must," a "S" if the requirement is a "Should," a "C" if the requirement is a "Could," and a "W" if the requirement is a "Won't." This helps students to prioritize their work and

complete the work marked with an “M” first, so they are focused on creating the most important requirements first.

Sizing

Once prioritization is complete, teams need to size or estimate user stories. Sizing user stories helps teams determine the effort needed to complete a user story. This helps them understand how simple or complex a user story is so they can budget their time accordingly. The two most common sizing approaches are the Fibonacci sequence and t-shirt sizing. The Fibonacci sequence (1, 2, 3, 5, 8, 13, 21) is used because the gap between each number increases as the sequence progresses, reflecting the uncertainty and increasing difficulty in estimating larger tasks. The more complex the task, the higher the number given to the user story. T-shirt sizing uses standard t-shirt sizes: XS, S, M, L, XL. The purpose of t-shirt sizing is to quickly gauge the effort or complexity of a user story.

Planning the First Iteration

Once the project kickoff activities are complete, the teams plan for the first iteration of work. The first step in iteration planning is to select the user stories with the highest priority (“M” for “Must”). The “Must” user stories will be completed first. Each team evaluates their “Must” user stories and estimates how many of them (based on the sizing) they can complete in the first round of work (two weeks, two class periods, one month, etc.). User stories that have a higher sizing increment reflect more complex and difficult work, which will take longer. Sizing helps teams understand the level of effort required to complete the user story so they do not over-commit to completing work. After user stories are selected, each team member signs up to complete user stories during the iteration. Iteration planning takes practice, and students will most likely not get it right at first.