

Better (Small) Scientific Software Teams

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Better Scientific Software tutorial
ISC18, Frankfurt, Germany

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Acknowledgements

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Outline

- Small Team Models, Challenges.
- Agile workflow management for small teams
 - Intro to terminology and approaches
 - Overview of Kanban
 - Free tools: Trello, GitHub.

Small Teams

Ideas for managing transitions and steady work.

Small team interaction model

- Team composition:
 - Senior staff, faculty:
 - Stable presence, in charge of science questions, experiments.
 - Know the conceptual models well.
 - Spend less time writing code, fuzzy on details.
 - Junior staff, students:
 - Transient, dual focus (science results, next position).
 - Staged experience: New, experienced, departing.
 - Learning conceptual models.
 - Write most code, know details.

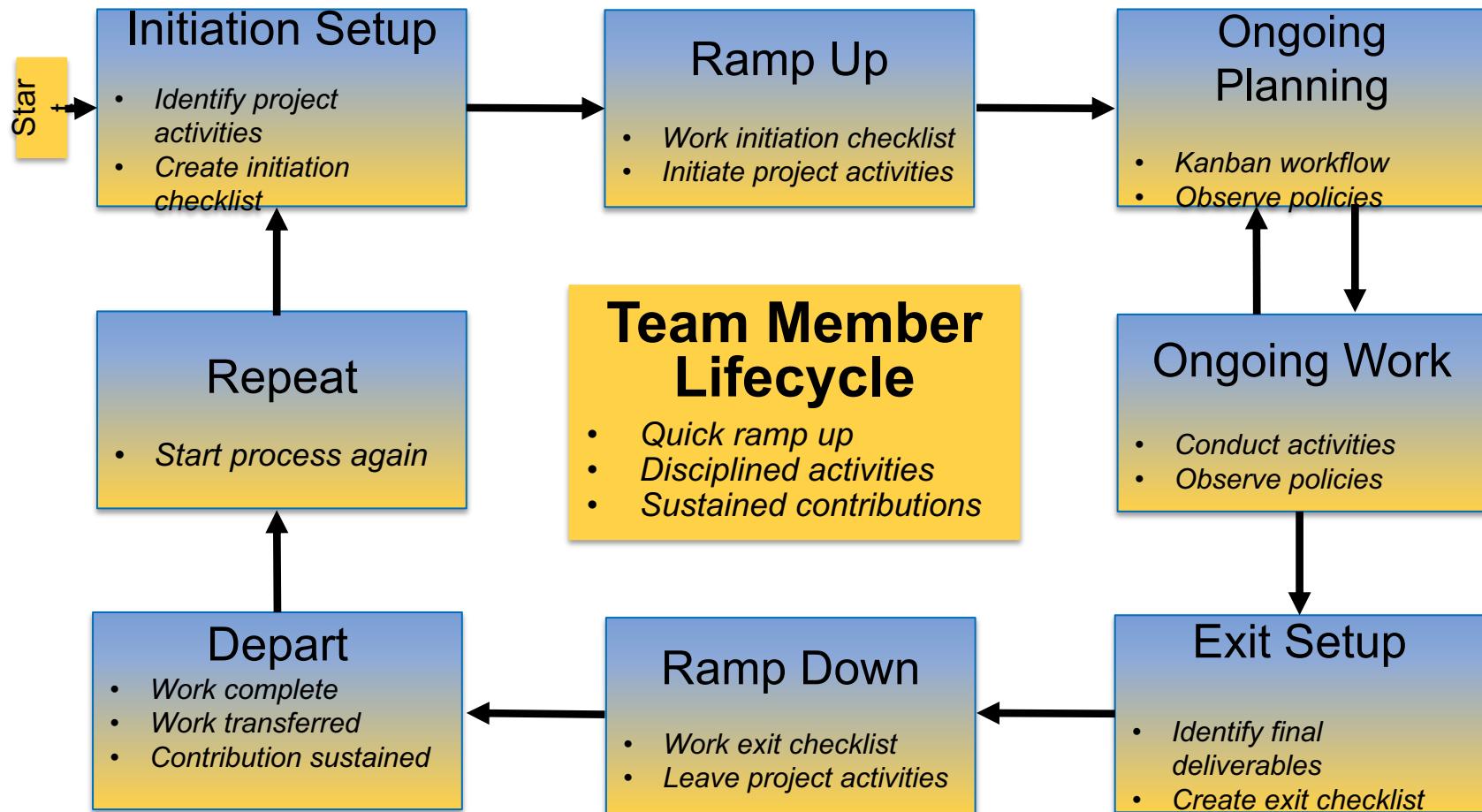
Large team challenges

- Composed of small teams (and all the challenges).
- Additional interaction challenges.
- Policies, regularly cultural exchanges important.

Small team challenges

- Ramping up new junior members:
 - Background.
 - Conceptual models.
 - Software practices, processes, tools.
- Preparing for departure of experienced juniors.
 - Doing today those things needed for retaining work value.
 - Managing dual focus.

Research Team Member Lifecycle



Checklists & Policies

Team Member Phase		
New Team Member	Steady Contributor	Departing Member
Checklist	Policies	Checklist

- New, departing team member checklists:
 - ▣ Example: Trilinos New Developer Checklist.
 - ▣ <https://software.sandia.gov/trilinos/developer/sqp/checklists/index.html>
- Steady state: Policy-driven.
 - ▣ Example: xSDK Community policies.
 - ▣ <https://x sdk.info/policies/>

Your checklists & policies?

- Checklist: New team member?
- Policies: Ongoing work?
- Checklist: Before someone departs?

Collaborative Work Management

Managing with Kanban

Managing issues: Fundamental software process

Continual improvement

- Issue: Bug report, feature request

- Approaches:

- Short-term memory, office notepad
- ToDo.txt on computer desktop (1 person)
- Issues.txt in repository root (small co-located team)
- ...
- Web-based tool + Kanban (distributed, larger team)
- Web-based tool + Scrum (full-time dev team)

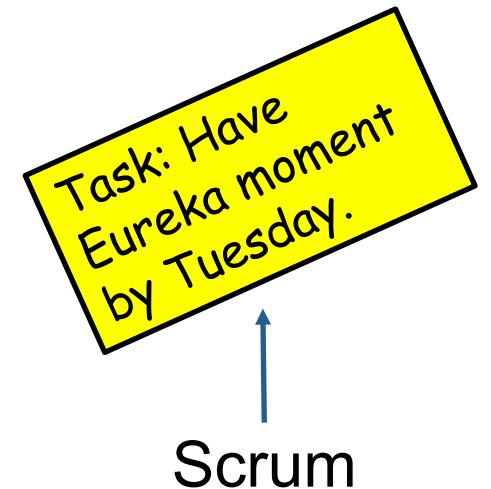


Informal, less training

Formal, more training

Kanban principles

- Limit number of “In Progress” tasks
- Productivity improvement:
 - Optimize “flexibility vs swap overhead” balance. No overcommitting.
 - Productivity weakness exposed as bottleneck. Team must identify and fix the bottleneck.
 - Effective in R&D setting. Avoids a deadline-based approach. Deadlines are dealt with in a different way.
- Provides a board for viewing and managing issues



Basic Kanban

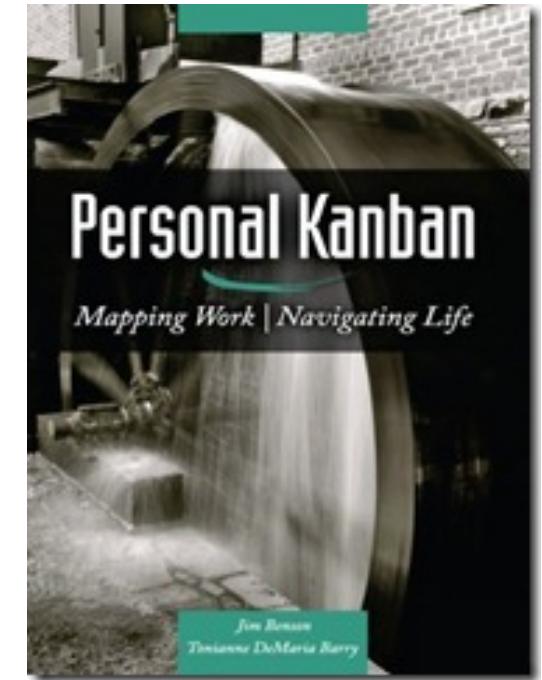
Backlog	Ready	In Progress	Done
<ul style="list-style-type: none">• Any task idea• Trim occasionally• Source for other columns	<ul style="list-style-type: none">• Task + description of how to do it.• Could be pulled when slot opens.• Typically comes from backlog.	<ul style="list-style-type: none">• Task you are working on <i>right now</i>.• The only kanban rule: Can have only so many “In Progress” tasks.• Limit is based on experience, calibration.• Key: Work is pulled. You are in charge!	<ul style="list-style-type: none">• Completed tasks.• Record of your life activities.• Rate of completion is your “velocity”.

Notes:

- Ready column is not strictly required, sometimes called “Selected for development”.
- Other common column: In Review
- Can be creative with columns:
 - Waiting on Advisor Confirmation.
 - Tasks I won’t do.

Personal Kanban

- Personal Kanban: Kanban applied to one person.
 - Apply Kanban principles to your life.
 - Fully adaptable.
- Personal Kanban: Commercial book/website.
 - Useful, but not necessary.



<http://www.personalkanban.com>

Kanban tools

- Wall, whiteboard, blackboard: Basic approach.
- Software, cloud-based:
 - Trello, JIRA, GitHub Issues.
 - Many more.
- I use Trello (browser, iPhone, iPad).
 - Can add, view, update, anytime, anywhere.

Big question: How many tasks?

- Personal question.
- Approach: Start with 2 or 3. See how it goes.
- Use a freeway traffic analogy:
 - Does traffic flow best when fully packed? No.
 - Same thing with your effectiveness.
- Spend time consulting board regularly.
 - Brings focus.
 - Enables reflection, retrospection.
 - Use slack time effectively.
 - When you get out of the habit, start up again.



Importance of “In Progress” concept for you

- Junior community members:
 - Less control over task.
 - Given by supervisor.
- In Progress column: Protects you.
 - If asked to take on another task, respond:
 - Is this important enough to become less efficient?
 - Sometimes it is.

Key Team Management Elements

- **Checklists:**
 - Initiation, Transition, Exit
- **Policies:**
 - How team conducts its work
- **Issue tracking system:**
 - All work tracked, visible to team
 - Milestones: Aggregate related issues.
 - Kanban board
 - Regular meetings, updates

Samples from Collegeville Org: Policies, Initiation Checklist

Collegeville / Labora Private

Unwatch 9 Star 0 Fork 0

Code Issues 25 Pull requests 0 Projects 1 Wiki Settings Insights

Branch: master Labora / TeamPolicy.md Find file Copy path

maherou Fix formatting 51f30e2 a minute ago 1 contributor

21 lines (18 sloc) 1.53 KB Raw Blame History

Collegeville Research Team Policies

The following policies are meant to guide team members in their activities, establishing expectations for ongoing work.

1. Team members will conduct themselves in a professional manner, observing institutional policies given to them at student and faculty orientation.
2. Initiation, transition and exit events will be guided by creating and following an event checklist.
3. All work will be tracked in the organization issues-only repository [Labora](#).
4. All work, notes and relevant content will be kept in a repository associated with the team GitHub organization.
5. Each team member will have an individual Collegeville repository: Lastname-Firstname-Work.
This repo contains:
 - i. Thesis or dissertation, as appropriate.
 - ii. Annotated bibliography of resources.
 - iii. Personal notes from project meetings and research activities.
6. If work is appropriate for one of the team repos, it will be retain there. Otherwise, it is kept in the team member's individual repo.
7. Team members will update project Kanban board prior to team meetings, more frequently if particularly active.
8. Exceptions to these policies are acceptable, but:
 - i. Important exceptions should be approved before acting.
 - ii. Other exceptions should mentioned at next team meeting or before.
 - iii. Exceptions should be infrequent.
 - iv. If an exception is frequent, actions or policies should be updated.
9. Any concerns not addressed by team policies should be discussed with Dr. Heroux.

Collegeville / Labora Private

Unwatch 9 Star 0 Fork 0

Code Issues 25 Pull requests 0 Projects 1 Wiki Settings

Neil Lindquist Initiation Checklist #17

Closed maherou opened this issue on Mar 31 • 0 comments

maherou commented on Mar 31 • edited by neil-lindquist

This is the initial checklist for Neil's initiation into the Collegeville research project:

- ✓ Create a GitHub account (if you don't have one) and ask Dr Heroux to add you to the Collegeville organization.
- ✓ Become a member of all appropriate repositories in the Collegeville organization.
- ✓ Identify any new repos that should be created, especially if your research topic is new.
- ✓ Learn LaTeX using the <https://github.com/Collegeville/Scribe> repository.
- ✓ At least one of your repos will be a LaTeX collection that will contain your annotated bibliography and the starting point for at least one technical report, which will be an ongoing record of your progress.
- ✓ Sign up for a Udacity online learning account at <https://www.udacity.com>, if you don't have one already. You will use Udacity for some of your introductory training.
- ✓ Take the Udacity course Software Development Proces at <https://classroom.udacity.com/courses/ud805>.
- ✓ Take the Udacity course How to Use Git and GitHub at <https://classroom.udacity.com/courses/ud775>.
- ✓ Take the online courses in C++: <http://www.cprogramming.com/tutorial/c++-tutorial.html> and <http://www.cplusplus.com/doc/tutorial>
- ✓ Redo CS200 lab exercises in C++

maherou assigned maherou and neil-lindquist on Mar 31

maherou added this to the Neil Lindquist Initiation milestone on Mar 31

maherou added to Ready in Collegeville team Kanban board on Mar 31

maherou moved from Ready to In progress in Collegeville team Kanban board on May 15

Neil Lindquist moved from In progress to Done in Collegeville team

Samples from Collegeville Org: Kanban Board

Collegeville / Labora Private

Code Issues 25 Pull requests 0 Projects 1 Wiki Settings Insights

Collegeville team Kanban board Filter cards Show

Backlog (6)	Ready (2)	In progress (14)	In Review (5)	Done (24)
<p>Evaluate Zapier for automated workflows #6 opened by maherou</p> <p>Evaluate JuliaSparse #8 opened by maherou</p> <p>Create Julia evaluation repo #4 opened by maherou</p> <p>Explore the use of composition of containers with Tramonto and Trilinos</p>	<p>Develop Sagatagan New Team Member Checklist #11 opened by maherou</p> <p>Assess the use of TensorFlow for parameter value selection in scientific codes #14 opened by maherou</p>	<p>Trilinos metadata block #49 opened by duongdo27</p> <p>Explore possibility of moving download files for Trilinos and Mantevo to GitHub #47 opened by jwillenbring</p> <p>Make expandable map for Better Scientific Software #46 opened by</p>	<p>Migrate mantevo.org to mantevo.github.io #3 of 3 opened by maherou</p> <p>Concept map project for better scientific software #35 opened by duongdo27</p> <p>Assess requirements for using github.io as host platform for Trilinos.org</p>	<p>Regard the outlook of the concept map #39 opened by duongdo27</p> <p>Handle markdown file without links in Better Scientific Software #42 opened by duongdo27</p> <p>Finding correspond links for the Github files in the Better Scientific Software #41 opened by duongdo27</p>

Team Management Example

Team Policy

Checklists

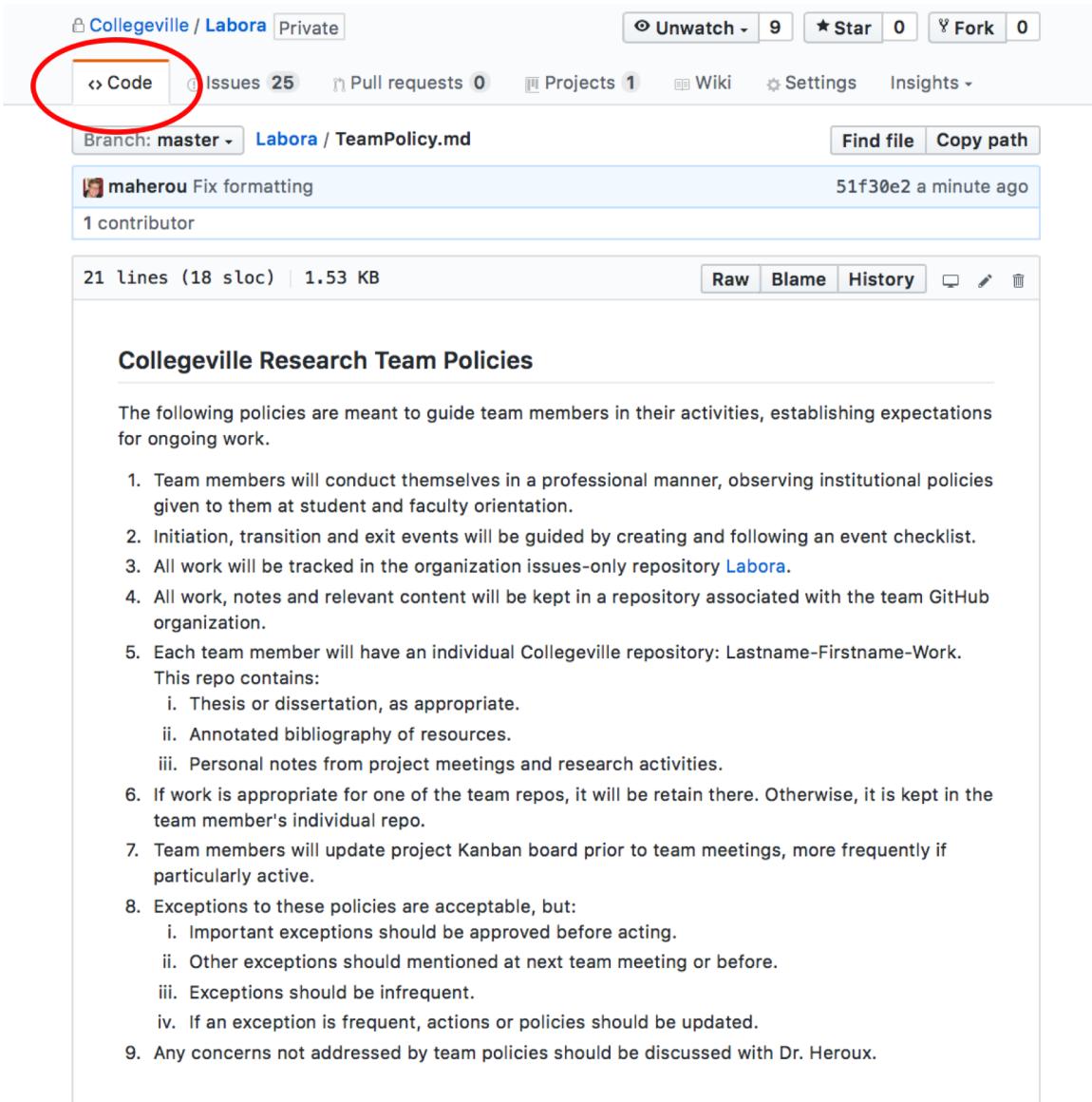
Kanban Board

Step 1: Create Issues-only GitHub repo

- Go to <https://github.com/username>
 - Example: <https://github.com/maherou>
- Create new repo:
 - Click on “+” (upper right).
 - Select New repository...
 - Give repo a name, e.g., **Issues**
 - Select Public. In real life, this repo is often private (requires \$ or special status)
 - Init with README.
 - Don’t add .gitignore or license.
 - Click Create Repository.

Step 2: Define Team Policy

- Create file:
 - Go to new repo: Issues.
 - Select <> Code tab.
 - Select Create new file TeamPolicy.md
- Questions to address:
 - How members support team?
 - How team supports members?
- Community version:
 - <http://contributor-covenant.org>
- Policy is living document:
 - Informal good practices added.
 - Avoidable bad situations addressed.



The screenshot shows a GitHub repository page for 'Collegeville / Labora'. The 'Code' tab is highlighted with a red circle. The repository details show 'Issues 25', 'Pull requests 0', 'Projects 1', 'Wiki', 'Settings', and 'Insights'. The file 'TeamPolicy.md' is listed under 'Branch: master'. The commit history shows a single commit by 'maherou' titled 'Fix formatting' made '51f30e2 a minute ago'. The file content is titled 'Collegeville Research Team Policies' and contains a list of 9 items detailing team policies. The GitHub interface includes 'Raw', 'Blame', and 'History' buttons at the bottom.

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The following policies are meant to guide team members in their activities, establishing expectations for ongoing work.

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Step 3a: Create Issues

- Select the Issues tab.
- Click on New Issue.
- Type in task statement 1 (from list).
 - Type in title only.
- Click Submit new issue
- Repeat.

The screenshot shows a GitHub repository page for 'Collegeville / Labora'. The 'Issues' tab is selected, indicated by an orange circle around the 'Issues 24' link. Another orange circle highlights the green 'New issue' button in the top right corner of the header. The main area displays a list of 24 open issues, each with a title, a small icon, and some metadata like the number of comments or pull requests. The issues listed include tasks such as migrating software, implementing features in Julia, and exploring possibilities for moving files to GitHub.

Step 3b: Create Initiation Checklist

- Select the Issues tab.
- Click on New Issue.
- Select a classmate.
- Type in title: Pat Evans Initiation Checklist
- Add checklist items:
 - Use syntax (note the spaces):
- [] Description

The screenshot shows a GitHub repository titled "Collegeville / Labera" with 25 issues. A red circle highlights the "Issues" tab. Below it, a specific issue titled "Neil Lindquist Initiation Checklist #17" is shown as closed. A comment from "maherou" on Mar 31 states: "This is the initial checklist for Neil's initiation into the Collegeville research project:" followed by a detailed checklist. The checklist items are:

- ✓ Create a GitHub account (if you don't have one) and ask Dr Heroux to add you to the Collegeville organization.
- ✓ Become a member of all appropriate repositories in the Collegeville organization.
- ✓ Identify any new repos that should be created, especially if your research topic is new.
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- ✓ Take the Udacity course Software Development Proces at <https://classroom.udacity.com/courses/ud805>.
- ✓ Take the Udacity course How to Use Git and GitHub at <https://classroom.udacity.com/courses/ud775>.
- ✓ Take the online courses in C++: <http://www.cprogramming.com/tutorial/c++-tutorial.html> and <http://www.cplusplus.com/doc/tutorial>
- ✓ Redo CS200 lab exercises in C++

Below the checklist, there are several activity notifications:

- maherou assigned maherou and neil-lindquist on Mar 31
- maherou added this to the Neil Lindquist Initiation milestone on Mar 31
- maherou added to Ready in Collegeville team Kanban board on Mar 31
- maherou moved from Ready to In progress in Collegeville team Kanban board on May 15

Step 4: Create Kanban Board

- Select Projects tab
- Click New Project
- Use title
 - Team Kanban board
- Add these columns:
 - Backlog, Ready, In progress, In review, Done.
- Click on +Add cards (upper right).
 - Move each issue to the proper Kanban column

The screenshot shows a GitHub organization named 'Collegeville' with a repository named 'Labora'. The repository is set to 'Private'. At the top, there are tabs for 'Code', 'Issues 25', 'Pull requests 0', and 'Projects 1'. The 'Projects' tab is highlighted with a red circle. Below the tabs, the page title is 'Collegeville team Kanban board'. The Kanban board itself has five columns: 'Backlog' (6 items), 'Ready' (2 items), 'In progress' (14 items), 'In review' (5 items), and 'Done' (24 items). Each column contains a list of GitHub issues with their titles, IDs, and assignees. For example, in the 'In progress' column, there are issues like 'Trilinos metadata block' (#49) and 'Explore possibility of moving download files for Trilinos and Mantevo to GitHub' (#47).

Next Steps: Real Life

- Create a GitHub Org and set of repos for your team:
 - Each team member has an individual repo.
 - Each project has a repo.
 - One special repo for issues.
- Track all work:
 - Use checklists for initiation, exit, any big new effort.
 - Create Kanban board. Keep it current.
 - Aggregate related issues using milestones.
- Drive meetings using Kanban board.
- Adapt this approach to meet your needs.
- When you start to get sloppy, get back on track.



Other resources

The Agile Samurai: How Agile Masters Deliver Great Software (Pragmatic Programmers), Jonathan Rasmusson. Excellent, readable book on Agile methodologies. <https://www.amazon.com/Agile-Samurai-Software-Pragmatic-Programmers/dp/1934356581>

Also available on Audible.

Code Complete, Steve McConnell. Great text on software.

Construx website has large collection of content.

Agenda

Time	Topic	Speaker
2:00pm-2:30pm	Why Effective Software Practices are Essential for CSE Projects	Anshu Dubey, ANL
2:30pm-3:00pm	Introduction to Software Licensing	Michael A. Heroux, SNL
3:00am-3:30pm	Better (small) Scientific Software Teams	Michael A. Heroux, SNL
3:30am-4:00pm	Improving Reproducibility Through Better Software Practices	Michael A. Heroux, SNL
4:00pm-4:30pm	<i>Break</i>	
4:30pm-5:00pm	Testing HPC Scientific Software – Part 1	Anshu Dubey, ANL
5:00pm-5:30pm	Testing HPC Scientific Software – Part 2	Anshu Dubey, ANL
5:30pm-6:00pm	Code Coverage Hands-on and CI Demo	Anshu Dubey, ANL