

SYSTEM INTEGRATION, DEVOPS, FEASIBILITY STUDY SUPPORT

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AGENDA

- Overview
- DevOps walkthrough
- Workstream Integration
- SAGE Feasibility Report
 - Quest Walkthrough
 - Survey Analysis
 - Reference Diagram

OVERVIEW

Our focus this semester was integrating the various researcher workstreams through DevOps, researcher workflow management, development of SAGE's Quest sets, and facilitating research and authoring of the Sage Feasibility Study in preparation for publication.

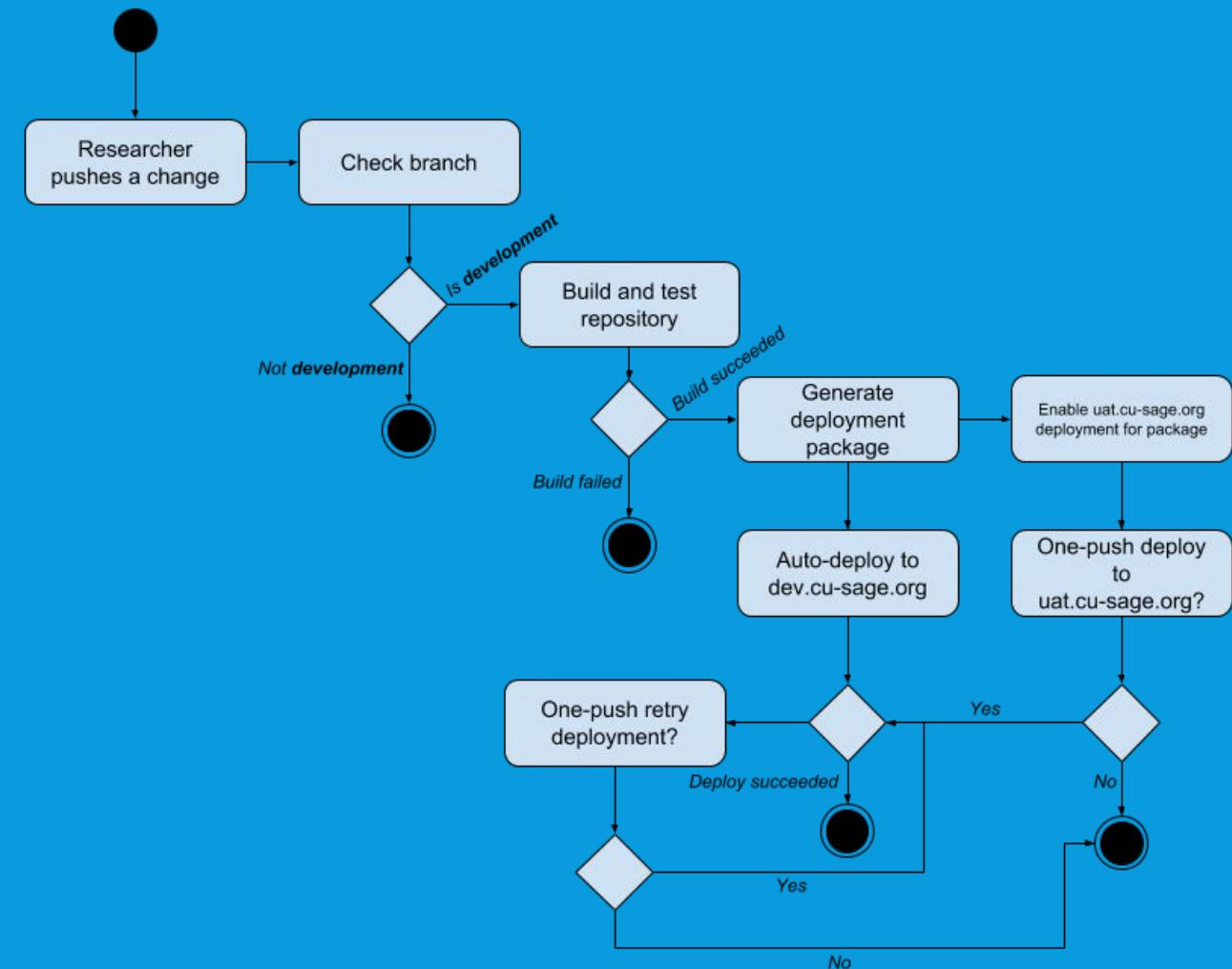
We believe this focus has helped the team create a demo-ready version of SAGE and developed the SAGE environment and project structure for highly efficient research in future semesters.

DEV OPS: WELCOME TO SAGE!

This demo will push a commit that updates an endpoint that allows an “invitation” email to be sent from SAGE.

DEV OPS

- VCS, build, release, test, and work breakdown structure all hosted in a single TFS platform.
- Commits to the “development” branch automatically built and pushed live.
- Tests run as part of the build process.
- Test coverage infrastructure is available (not enabled).
- “GitFlow” workflow management supported by VCS, build, test, and deploy systems.
- **Build automation via Gradle and Gulp integrated into all repositories**
- **Self-hosted SMTP functionality allows SAGE to send class invites and other notifications.**



DEV OPS: LIMITATIONS AND FUTURE WORK

- UAT deployments are manually triggered. **Find an optimal UAT build schedule and push “N-day’ly” builds.**
- DevOps doesn’t support local development environments. **Implement configuration management.**
- Testing API endpoints is cumbersome. **Integrate Newman (Postman CLI via Node).**
- Test coverage is lower than optimal. **Target >=75% test coverage.**

WORKSTREAM INTEGRATION

- SAGE successfully moved from local versions to a persistent, online instance early in the semester (dev.cu-sage.org), later duplicated into a second instance (uat.cu-sage.org)
- This operating version has been used to support user-centered designs throughout the semester



uat.cu-sage.org/instructor/#/coursePage/59f8c6fdc1bfb23c4ced8e20

Mission Management

- Mission Impossible
- The toughest Mission
- A

Missions

- Mission Save The World [User Centered Design]
- Save the world with coding blocks
- A

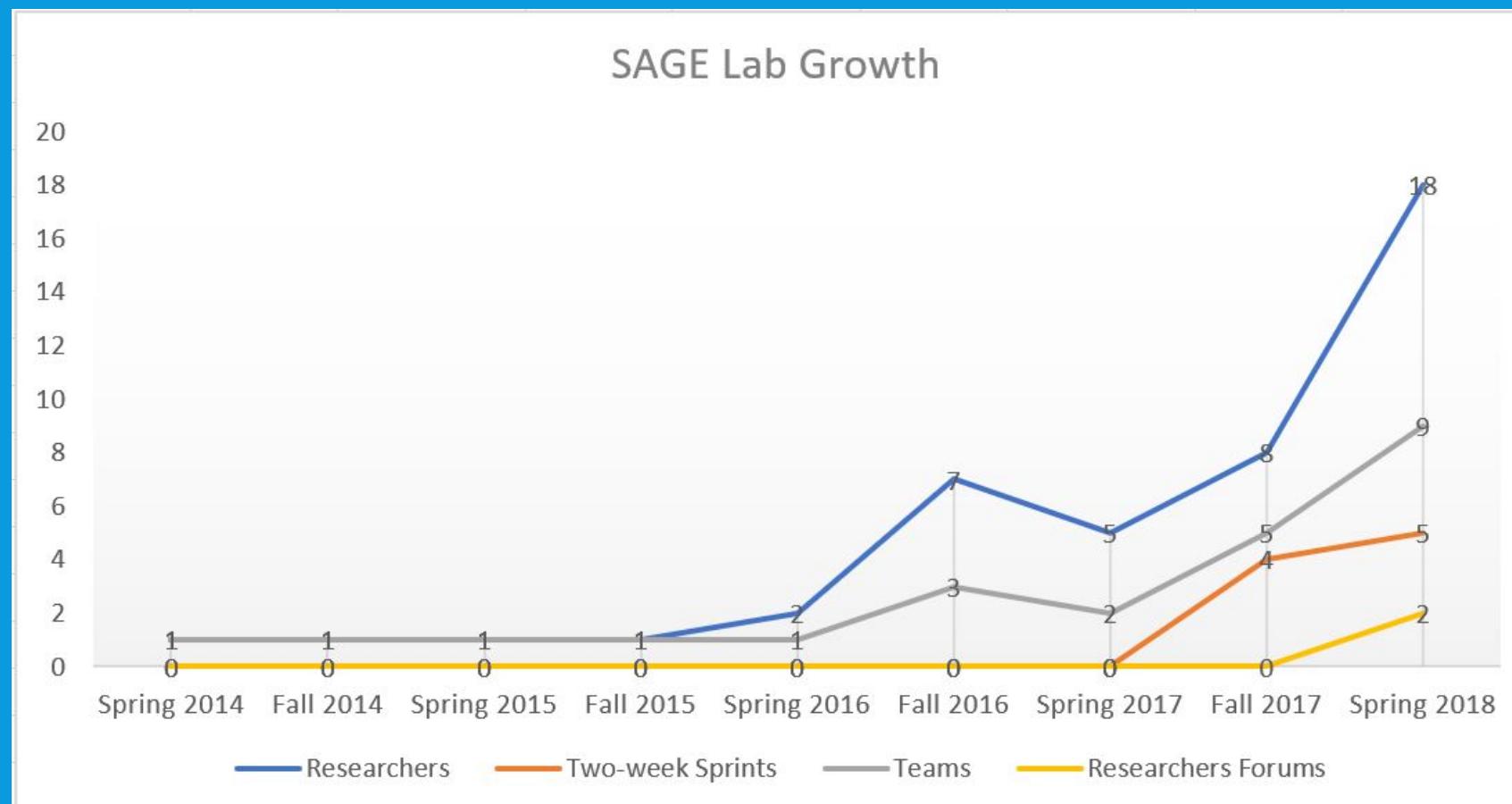
Quests

- test
- test
- star
- Entering the Loopy Forest
- Danger ahead!
- star
- Fun with Variables
- First Encounter
- Embracing new opportunity
- test
- Parson's Puzzles
- One Foot After Another
- The Beginning Quest
- Using all your inventory at once
- Double the Power
- Try this fun collection of brain teasers!
- Horseshoe
- Let's create our own world using computers!
- Making a World
- Conditional, loops, and output.
- Create New Quest

Create New Mission

WORKSTREAM INTEGRATION: TEAMWORK SUMMARY

SAGE continues to draw increasing interests from researchers as its field studies platform is coming together...



WORKSTREAM INTEGRATION: TEAMWORK SUMMARY

... which necessitates effective written and real-time communications among the growing team members.
In Spring 2018:

In Spring 2018:

- 27 new SAGE Wiki PDF pages added, now at 110 pages
 - A new Developer only Wiki created, with 20 additional new pages added this semester
 - Greater utilization of Slack, now with 9 active channels
 - Researcher Forums memorializes bi-monthly progress in the form of Wiki pages
 - Observably more iterations and engagements supported by increased tools utilizations

→ C Secure | <https://gudangdaya.atlassian.net/wiki/spaces/SAG/pages/208306177/Researcher+Forum>

SAGE-DEV

Pages

Meetings and Project Management

- 2017-03-03 SAGE Check-in
- Researcher Forum
 - 2018-01-26 Researcher Forum
 - 2018-02-16 Researcher Forum

SAGE Lab Sessions

Sprint Review Notes Fall 2017

Researcher Survey

Teams Work Area

Researcher Forum

Johan Sulaiman Lai
Last modified Mar 30, 2016

Meeting Guide

Prior to the meeting

- Please add several bullet points representing your activities since the last Researcher Forum. For example:
 - Progress/accomplishment/news (in SAGE, at school, at home, etc.)
 - Hurdle/roadblock
 - Connections, impact, and opportunities between your activities with other research teams' activities
- Indicates when a Sprint Story is closed, or have to move to the next Sprint
- Read what other researchers wrote

During the meeting

- Go around the room and speak about your highlights
- Field at least one question from the audience

The most important Meeting Metric that matters is engagement!

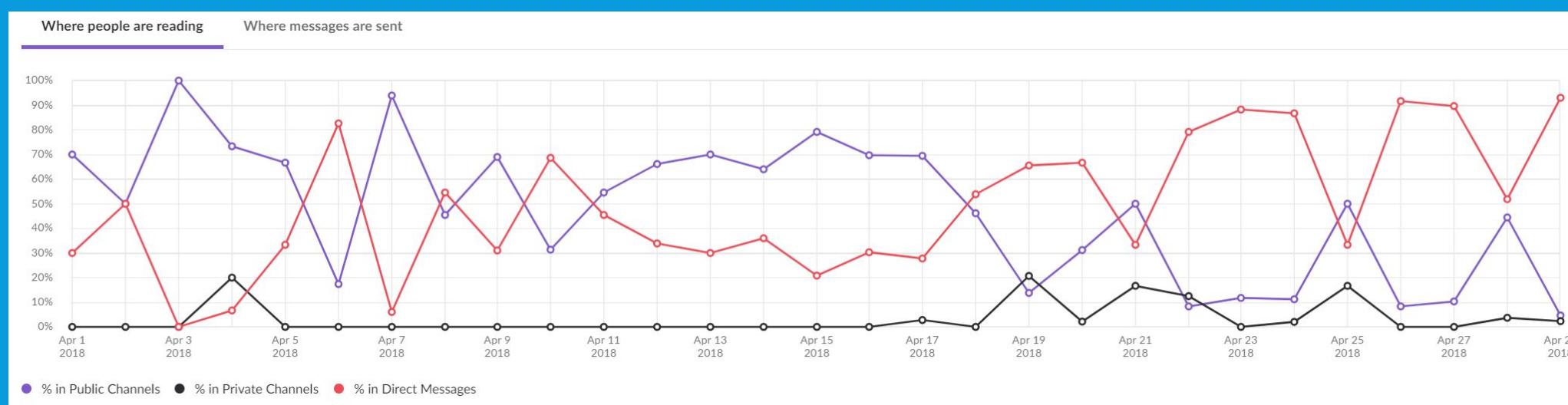
Researcher	Teams Membership		Invite Accepted?	Attended?
@Adiza Sumuna Awwal	Field Study Team	<p>SAGE Feasibility Study:</p> <ul style="list-style-type: none">Interview and UCD AnalysisIdentified tools and systems for qualitative analysis of interviewsDevelopment of UCD and semi-structured interview protocol		
@Alex Dzieni	Integration Team, IHS POC	<p>SAGE Integration Completed:</p> <ul style="list-style-type: none">Added test suite to sage-frontendFixed tests in sage-nodeAdded test tasks to builds for both reposMigrated sage-frontend from GitHub to TFSUAT env is released via TFS automation (requires manual initiation as opposed to CD-on-green for dev to maintain stability) <p>SAGE Integration Next Steps:</p> <ul style="list-style-type: none">sage-scratch and scratch-analyzer migration to TFS, CI/CD buildsExpand test suitesSMTP on Dev and UATNewman configuration?Config management for local and shared environments? <p>IHS POC:</p> <ul style="list-style-type: none">Not started <p>IHS MVP Next Steps:</p> <ul style="list-style-type: none">On-demand hintsMulti-layer hinting POCHinting Integration with SAGE PointsChatbot POC?		
@Bicheng Jiang	Learning Metrics/GAS Team	<ul style="list-style-type: none">Completed:<ul style="list-style-type: none">Student progress bar of objective and VAL points and for each gameAggregate student progress bar of objective and VAL points for each questStudent spider graph visualization: depict aggregated CT Concept scores per-quest and per-game<ul style="list-style-type: none">one spider graph for each game with Hairball Analyses progress (mock data)merged spider graph (of each game) showing in the same chart for each questcollaborated with Gavi about the design and Harisman about the data modelNext:<ul style="list-style-type: none">keep on develop data in mLab, move forward to use data in mLabkeep on working on data creation in mLab and create leaderboardstart to do the aggregate spider graph per-missionstart to work on teacher mission monitoring and badge librarymoving forward to material		
@Chao-Yang Lo	Intelligence Hinting Team	<ul style="list-style-type: none">RESTful GET Integration - Done		

SAGE DEV WIKI SPACE

1 / 20

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WORKSTREAM INTEGRATION: LIMITATIONS AND FUTURE WORK



- What could be better: more utilization of Slack general channel to announce team's progress and feature updates, to cross-pollinate information
 - Automatic message posting to Slack with every TFS build could be effective
Commits are not tied to work items.
- We should update the researcher workflow to include work item IDs in commits (supported by TFS)
- Work could be more visible across the team. **Integrate shared demos announcements.**
- Some SAGE use cases aren't documented. **Create a use case / user persona inventory to guide future work.**
- Project management methodology is not fully formalized. **Build a project schedule for research in future semesters, with regular deliverables**

SAGE FEASIBILITY STUDY RELEVANT WORK

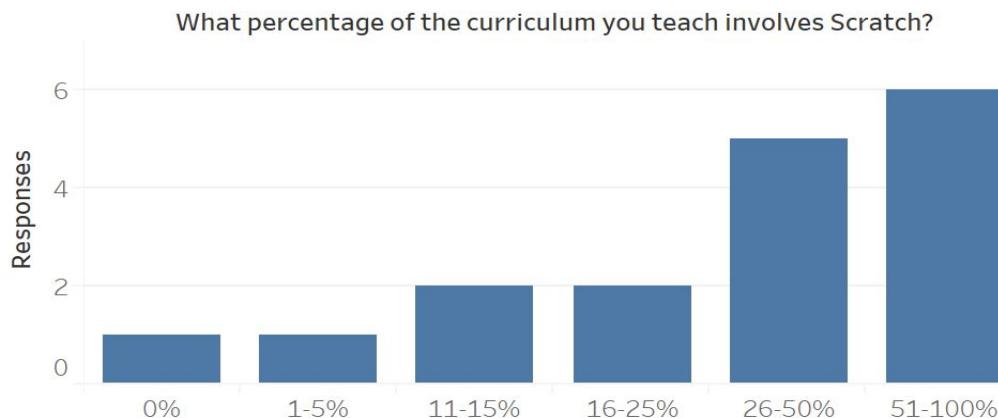
- Recent researches (Lee, et al 2013; Ihantola et al, 2016) show there is a continuing shortage of work on data-driven educational technology in general and in-game assessment specifically. This is due to several factors (Evans, 2012): 1) Current programmatic limitation still exists when it comes to distilling meaning from language, so free-form answers are difficult to interpret and assess, 2) a highly effective teaching method is debriefing, but this is challenging to administer, 3) there is a recognized higher risk for students to game or cheat the system. Another research (Harteveld, et al 2014) further boosts motivation for that the space for an educational game that teaches Computer Science or Computational Thinking is still wide open and fertile for new research
- [Mannila, et al 2014] There are nine CT aspects described by the CSTA/ISTE (**data collection, data analysis, data representation, problem decomposition, abstraction, algorithms, automation, simulation and parallelization**), these are the CT aspects that are also included as part of the survey.

SAGE FEASIBILITY STUDY: Demographics (TABLEAU)

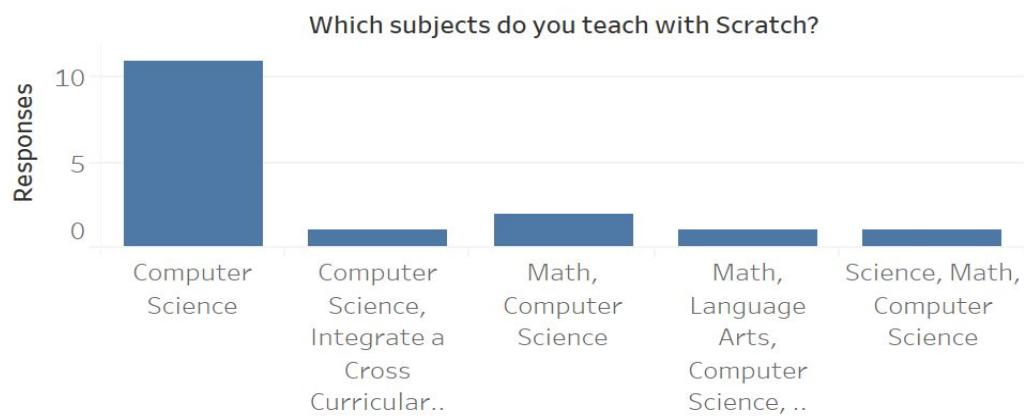
Experience with Scratch



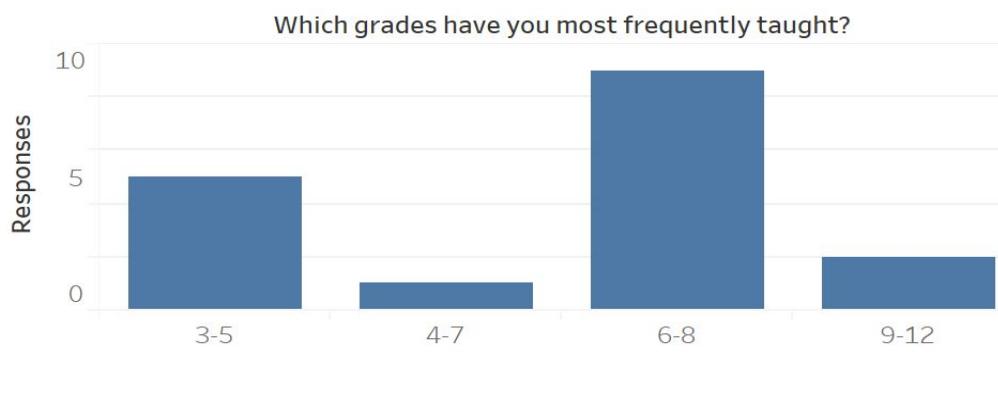
Share of Curriculum



Subjects



Grades



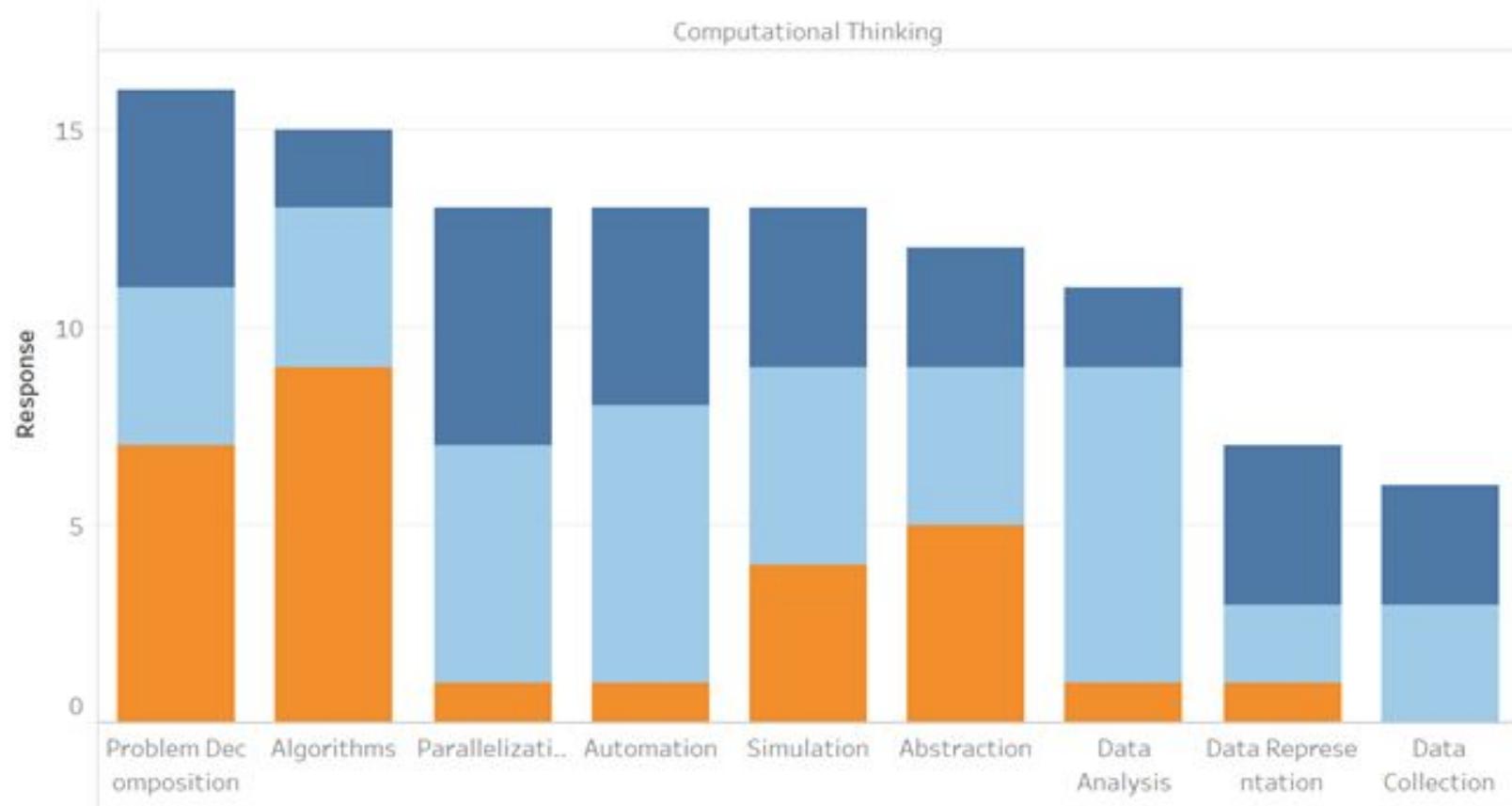
SAGE FEASIBILITY STUDY: SURVEY ANALYSIS (TABLEAU)

Teaching and Learning with Scratch - Computational Thinking

Computational thinking is the thought process involved in formulating a problem and expressing its solution in a way a computer can carry it out.

To what extent do students engage in the following activities while learning with Scratch?

Engagement Level
Sometimes
Often
Always



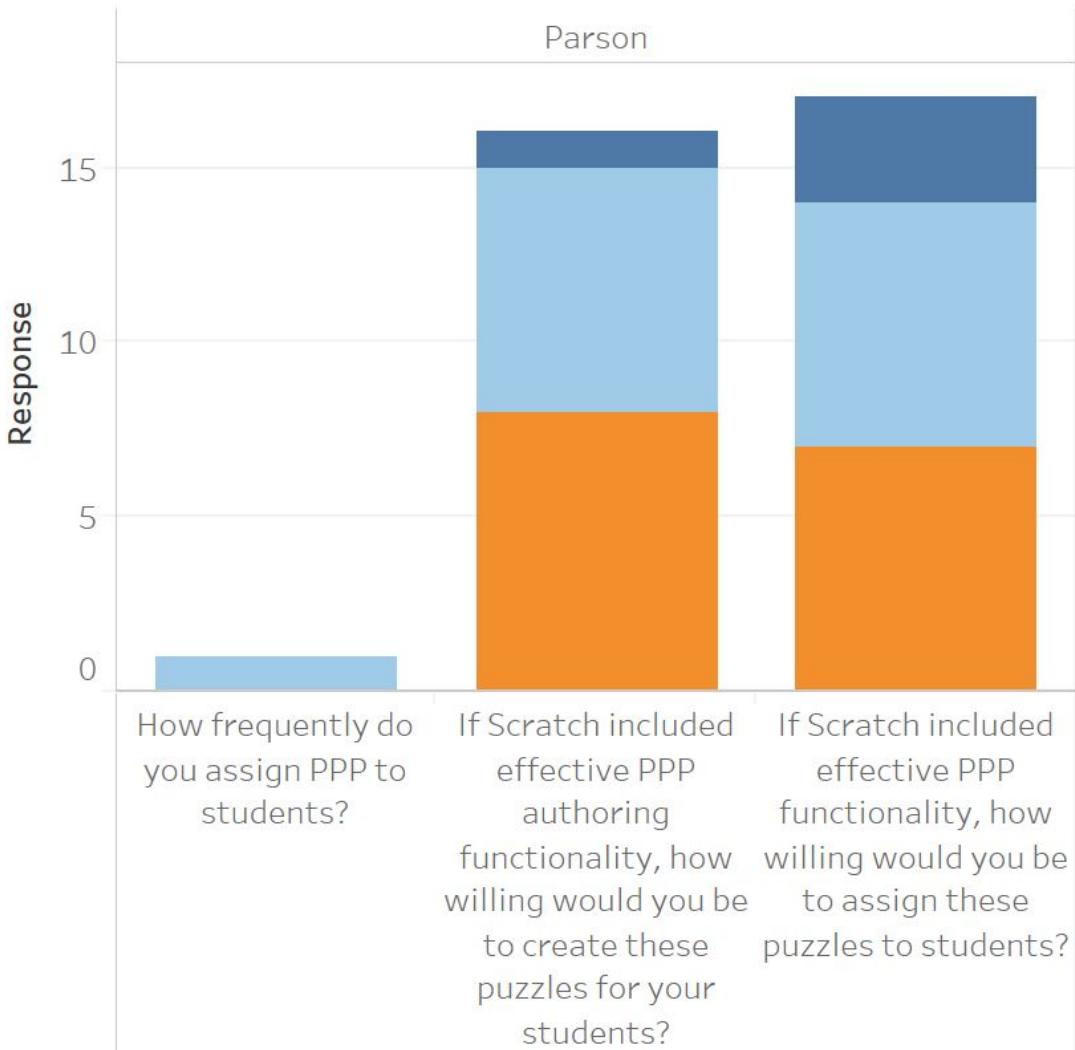
SAGE FEASIBILITY STUDY: SURVEY ANALYSIS (TABLEAU)

Teaching and Learning with Scratch - Parson's Programming Puzzles

Parson's Programming Puzzles (PPP) are a family of code construction assignments in which lines of code are given, and the task is to form the solution by sorting and selecting the correct code.

Engagement Level

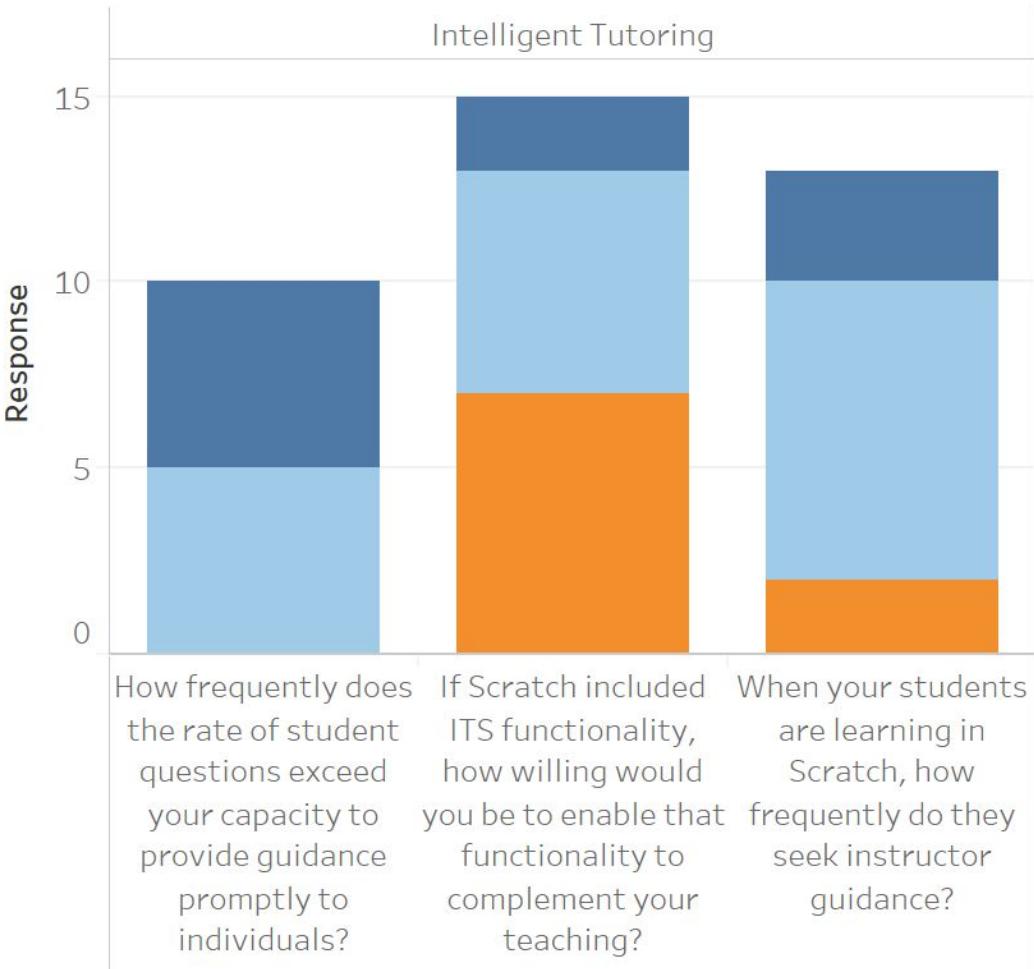
- Sometimes
- Often
- Always



SAGE FEASIBILITY STUDY: SURVEY ANALYSIS (TABLEAU)

Teaching and Learning with Scratch - Intelligent Tutoring Systems

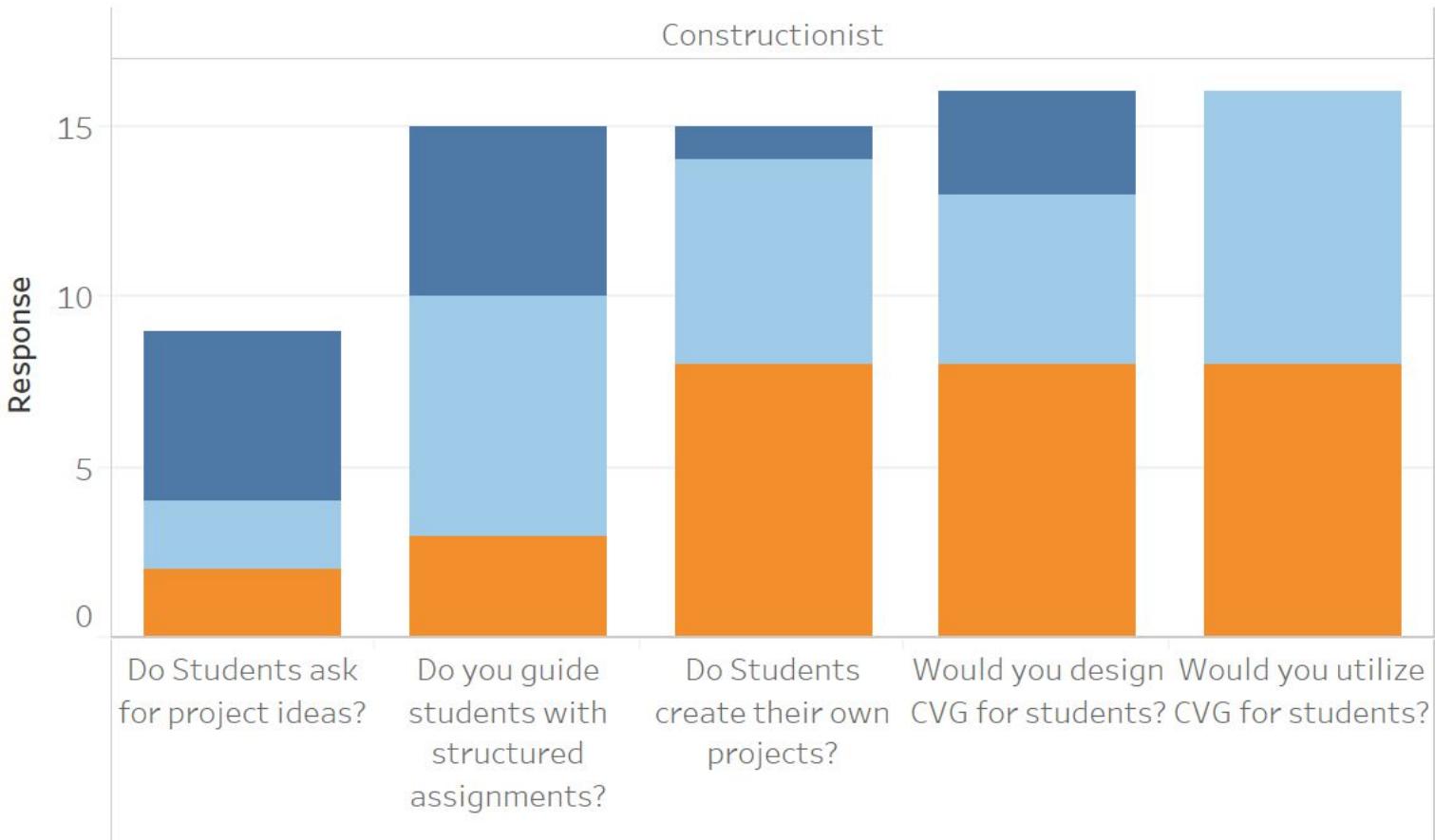
An intelligent tutoring system (ITS) provides immediate and customized instruction and feedback to students by a variety of delivery mechanisms such as just-in-time hints, on-demand information, and next-activity selection



SAGE FEASIBILITY STUDY: SURVEY ANALYSIS (TABLEAU)

Teaching and Learning with Scratch - Constructionist Video Games

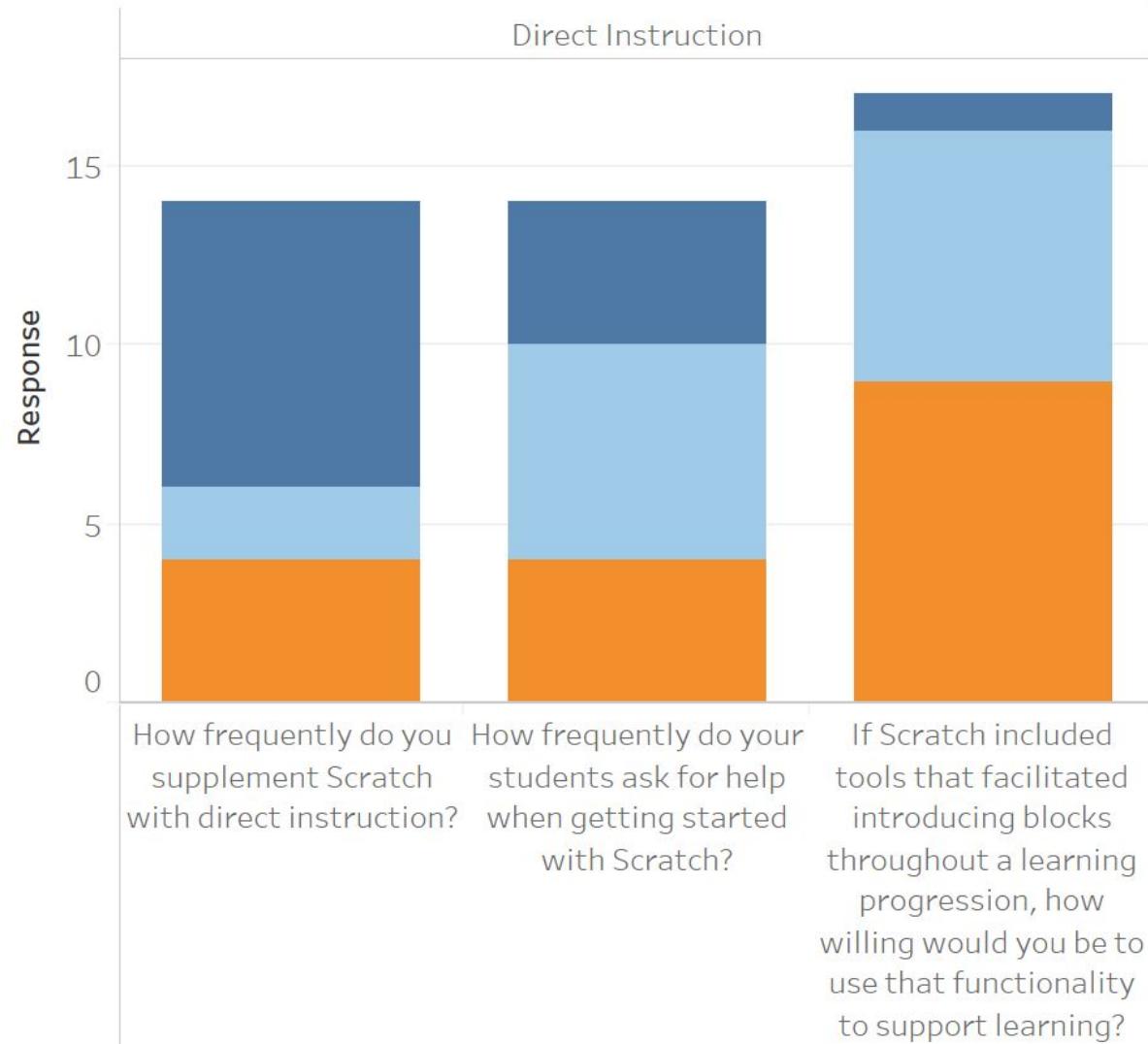
Constructionist Video Games (CVG) are designed environments in which players construct personally meaningful artifacts in order to overcome conflicts or obstacles resulting in quantifiable outcomes.

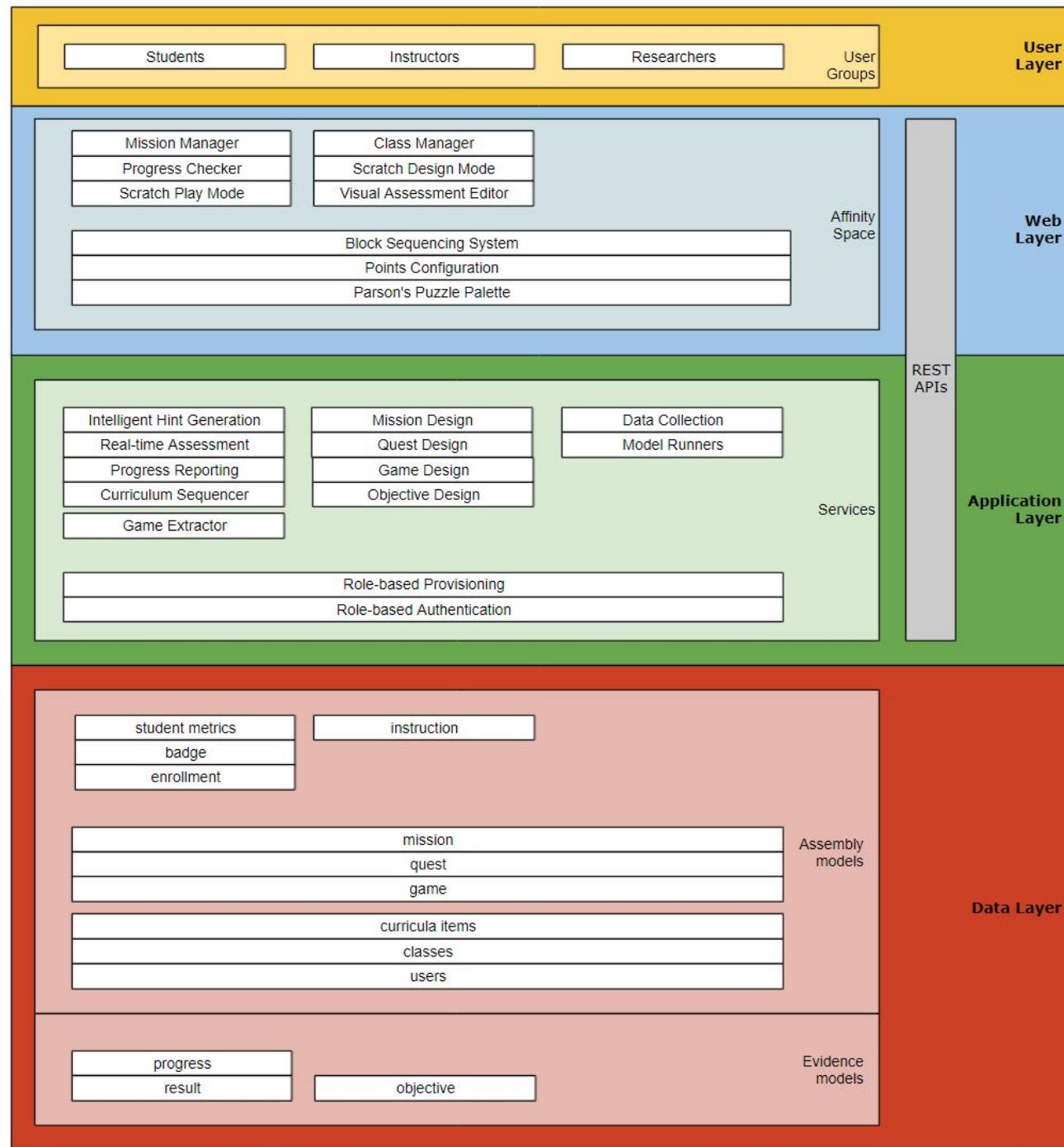


SAGE FEASIBILITY STUDY: SURVEY ANALYSIS (TABLEAU)

Teaching and Learning with Scratch - Direct Instruction

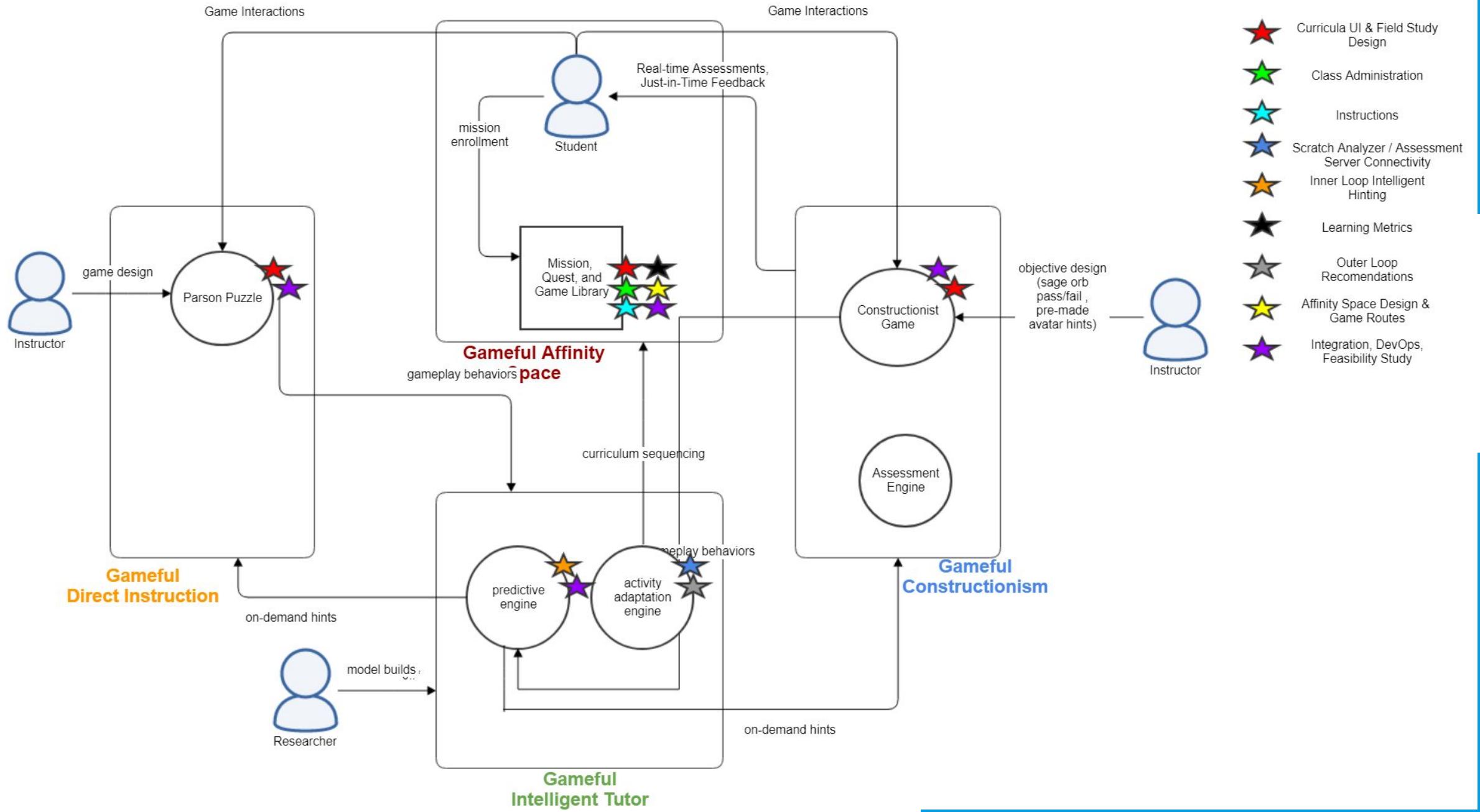
Direct instruction involves the explicit teaching of a skill-set through lecture, presentation, and demonstration





SAGE FEASIBILITY STUDY: REFERENCE DIAGRAM

SAGE Software Tiers

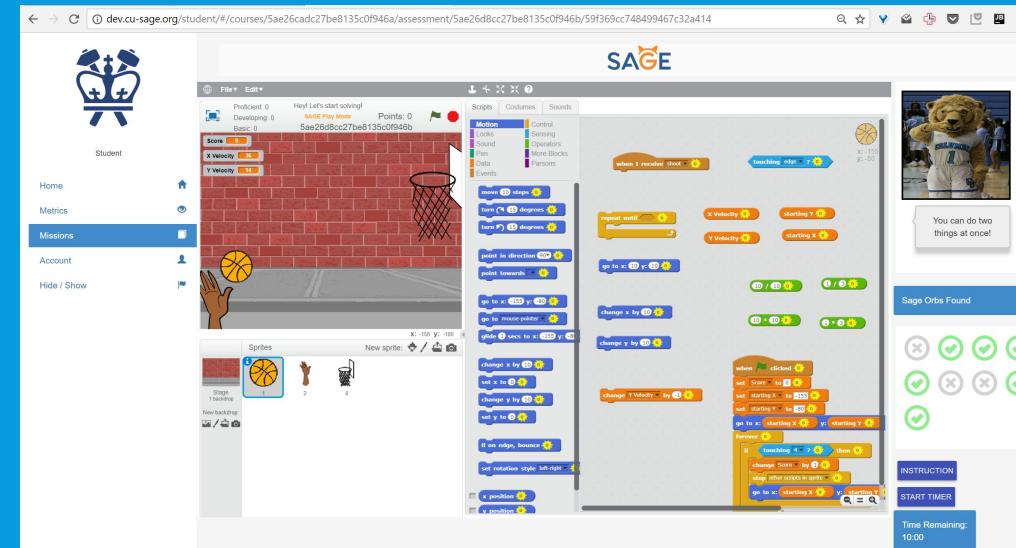


MAP SPRING 2018 TO SAGE ACTIVITY FLOW

Project	Team	Epic(s)	Feature(s)
Curricula UI & Field Study Design	Adiza Awwal, Lalitha Madduri, Mahzabin Hasnath	<ul style="list-style-type: none"> • Gameful Direct Instruction • Gameful Affinity Space • Field Study Design 	<ul style="list-style-type: none"> • Parson's Puzzle Library • Curricula Integration • SAGE Feasibility Study
Class Administration	Harsimran Bath, Yuval Schaal	<ul style="list-style-type: none"> • Gameful Affinity Space 	<ul style="list-style-type: none"> • Class Administration
Instructions	Jen-An Lien, Yuval Schaal	<ul style="list-style-type: none"> • Gameful Constructionism 	<ul style="list-style-type: none"> • Constructionist Game Library
Scratch Analyzer / Assessment Server Connectivity	Chao-Yang Lo	<ul style="list-style-type: none"> • Gameful Intelligent Tutoring 	<ul style="list-style-type: none"> • Programming Behavior Detection 1.1
Inner Loop Intelligent Hinting	Yi Ding, Weimeng Luo, Junyu Zhang	<ul style="list-style-type: none"> • Gameful Intelligent Tutoring 	<ul style="list-style-type: none"> • Intelligent Hinting 1.1
Learning Metrics	Bicheng Jiang, Jiaying Yang, Lillian Zha	<ul style="list-style-type: none"> • Gameful Affinity Space 	<ul style="list-style-type: none"> • Learning Metrics
Outer Loop Recommendations	Harsimran Bath, Weiman Sun	<ul style="list-style-type: none"> • Gameful Intelligent Tutoring 	<ul style="list-style-type: none"> • ITS Outer Loop
Affinity Space Design & Game Routes	Gavi Rawson	<ul style="list-style-type: none"> • Gameful Affinity Space • Gameful Constructionism 	<ul style="list-style-type: none"> • Game Mechanic Blocks
System Integration, DevOps, Feasibility Study Support	Alex Dziena, Johan Sulaiman	<ul style="list-style-type: none"> • SAGE Integration • Field Study Design 	<ul style="list-style-type: none"> • Workstream Integration • DevOps MVP • SAGE Feasibility Study

SAGE FEASIBILITY STUDY PROTOYPE & FUTURE WORK: CREATING AND USING QUEST SETS

- Quest 1: The Beginning Quest
 - Parson Puzzle 1-1: Basketball
 - CT concepts: Algorithm, Abstraction, Simulation, Automation, Parallelization
 - Parson Puzzle 2-2: A Square Remix
 - CT concepts: Algorithm, Problem Decomposition, Abstraction, Simulation
 - Constructionist Game 1



DEV OPS: WELCOME TO SAGE, CONT'd!

Can we receive an email from dev.cu-sage.org?

DEV OPS: RELATED WORK

- Dwaraki, A., Seetharaman, S., Natarajan, S., & Wolf, T. (2015, June). GitFlow: Flow revision management for software-defined networks. In Proceedings of the 1st ACM SIGCOMM Symposium on Software Defined Networking Research (p. 6). ACM.
- Wikipedia contributors. (2018, April 20). High availability. In Wikipedia, The Free Encyclopedia. Retrieved 02:47, May 1, 2018, from https://en.wikipedia.org/w/index.php?title=High_availability&oldid=837386863
- Govindan, R., Minei, I., Kallahalla, M., Koley, B., & Vahdat, A. (2016, August). Evolve or die: High-availability design principles drawn from googles network infrastructure. In Proceedings of the 2016 ACM SIGCOMM Conference (pp. 58-72). ACM.
- Wang, S., Ali, S., & Gotlieb, A. (2015). Cost-effective test suite minimization in product lines using search techniques. *Journal of Systems and Software*, 103, 370-391.
- Lwakatare, L. E., Kuvaja, P., & Oivo, M. (2015, May). Dimensions of devops. In International Conference on Agile Software Development (pp. 212-217). Springer, Cham.

WORKSTREAM INTEGRATION: RELATED WORK

- Pmi.org. (2018). Agile Approaches on Large Projects in Large Organizations. [online] Available at: <https://www.pmi.org/learning/academic-research/agile-approaches-on-large-projects-in-large-organizations> [Accessed 3 Feb. 2018].
- Pmi.org. (2018). Applying work breakdown structure to project lifecycle. [online] Available at: <https://www.pmi.org/learning/library/applying-work-breakdown-structure-project-lifecycle-6979> [Accessed 3 Feb. 2018].
- Sulaiman, J. 2017, "Responsive and Gameful SAGE Assessment," Columbia Programming Systems Lab. Columbia University, New York, NY

SAGE FEASIBILITY STUDY: RELEVANT WORK

- Evans, M., Jennings, E., and Andreen, M., 2012. "Assessment through achievement systems: a framework for educational game design," in *Developments in Current Game-Based Learning Design and Deployment*. IGI Global
- Harteveld, C., Smith, G., Carmichael, G., Gee, E., and Stewart-Gardiner, C., 2014. "A design-focused analysis of games teaching computer science," in *Proceedings of the Games, Learning and Society Conference*
- Ihantola, P., et al, 2016. "Educational Data Mining and Learning Analytics in Programming: Literature Review and Case Studies," in *Proceedings of the 2015 ITiCSE on Working Group Reports*, pp. 41-63
- Lee, M. J., Ko, A. J., and Kwan, I., 2013.. "In-game assessments increase novice programmers' engagement and level completion speed," in *Proceedings of the ninth annual international ACM conference on International computing education research*, pp. 153-160
- Mannila, L., Dagiene, V., Demo, B., Grgurina, N., Mirolo, C., Rolandsson, L., and Settle, A.. 2014. Computational Thinking in K-9 Education. In *Proceedings of the Working Group Reports of the 2014 on Innovation & Technology in Computer Science Education Conference (ITiCSE-WGR '14)*, Alison Clear and Raymond Lister (Eds.). ACM, New York, NY, USA, 1-29.