



NUSCollab: Tools for Online Collaboration

Teaching Enhancement Grant 2017

Dr. Cristina Carbunaru

Lecturer, School of computing, NUS

25 September 2018

Motivation

- Online collaboration and cooperation in project-based modules
 - Learning through social constructivism during online interactions
- Authentic learning environment
 - Use project management tools
- Project and team-based modules in School of Computing
 - CS3203 Software Engineering Project
 - CS4218 Software Testing
 - CS2103/T Software Engineering
 - Mostly Software Engineering area, but not only

Challenges

- Drawbacks of project management tools in the industry
 - Paid, cluttered with features, difficult to setup
- Managing multiple projects
 - Difficulty in tracking projects
 - Sharing and searching project-related information
- Ad-hoc online interactions
 - Ad-hoc collaboration among team members
 - Little input from teachers

For students

- Assessment of teamwork is difficult and man-power intensive
 - Manually check code repositories
 - Count tasks, contributions, etc.
 - Assess completion and contribution

For teachers

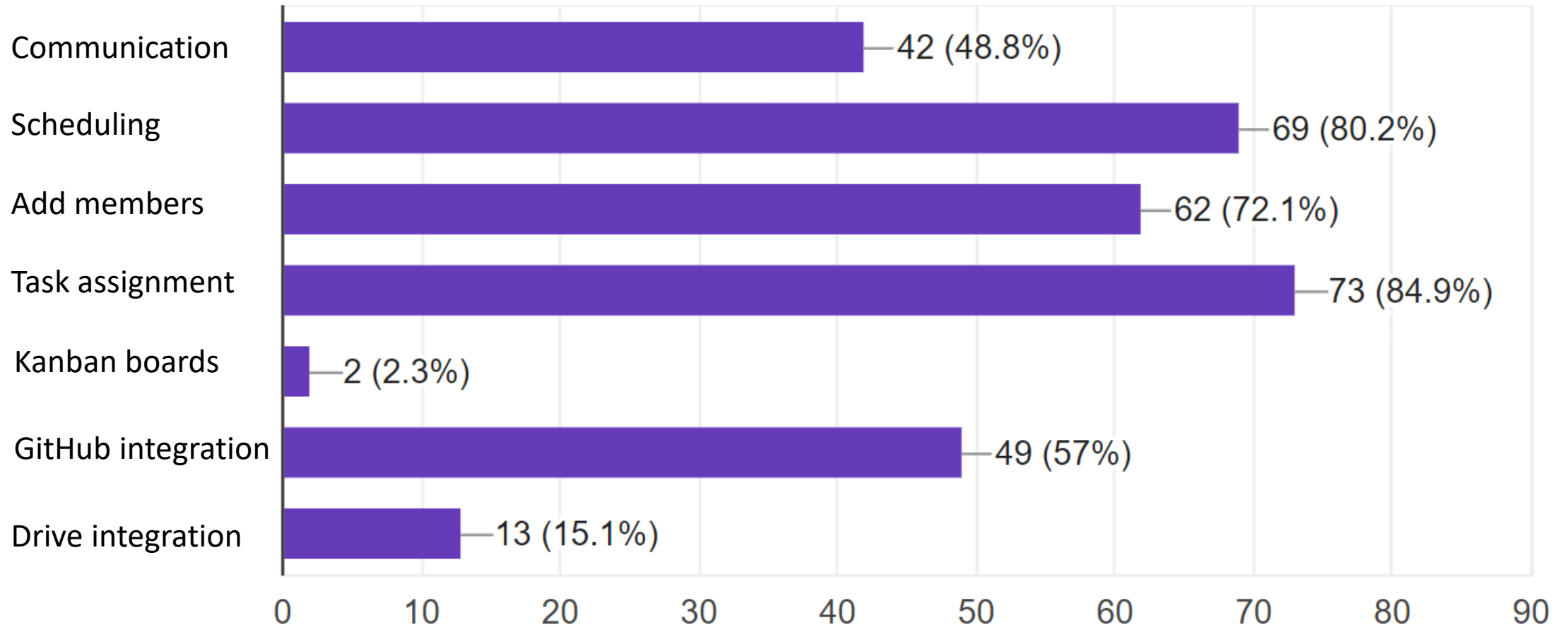
Ad-hoc Interactions - A Myriad of Tools

- Email and instant messaging
 - WhatsApp, Telegram, Google Hangouts and Facebook
- Collaborative editing tools
 - Google Drive and Dropbox
- Version control systems for software development
 - Git, Subversion, and Mercurial

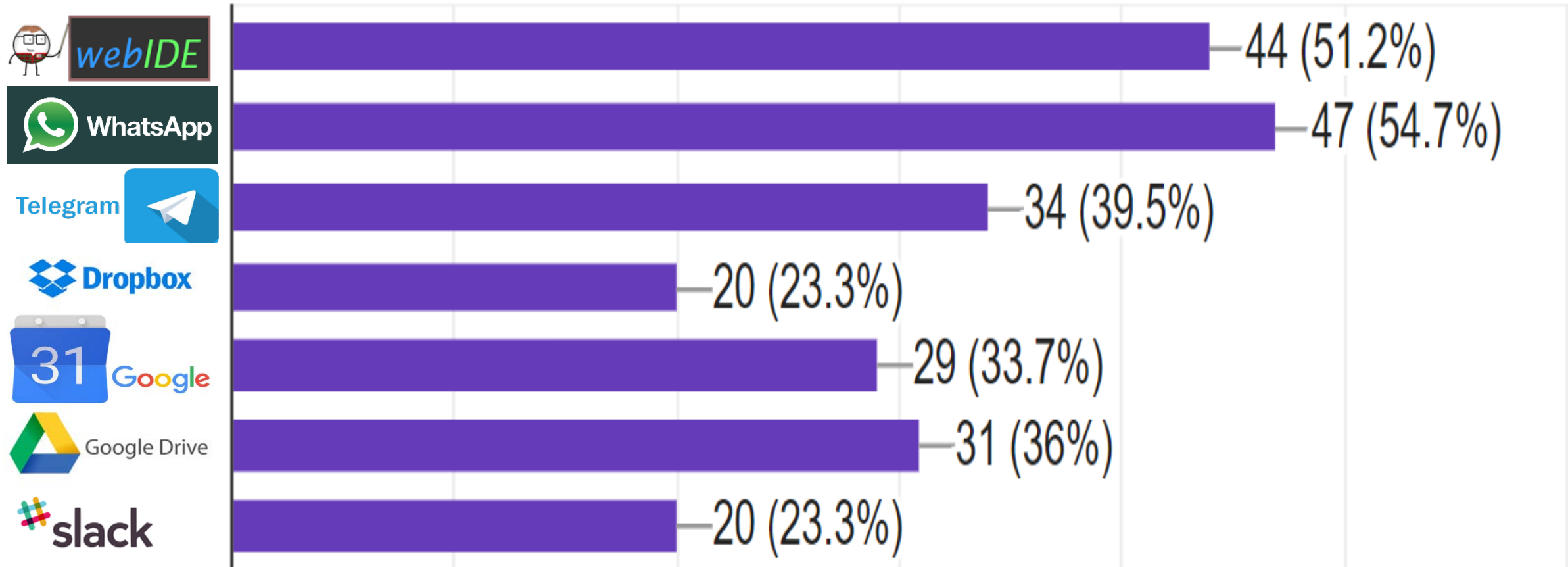
Unstructured learning!

Subjective assessment

Functionalities in Other PM Tools (Survey)

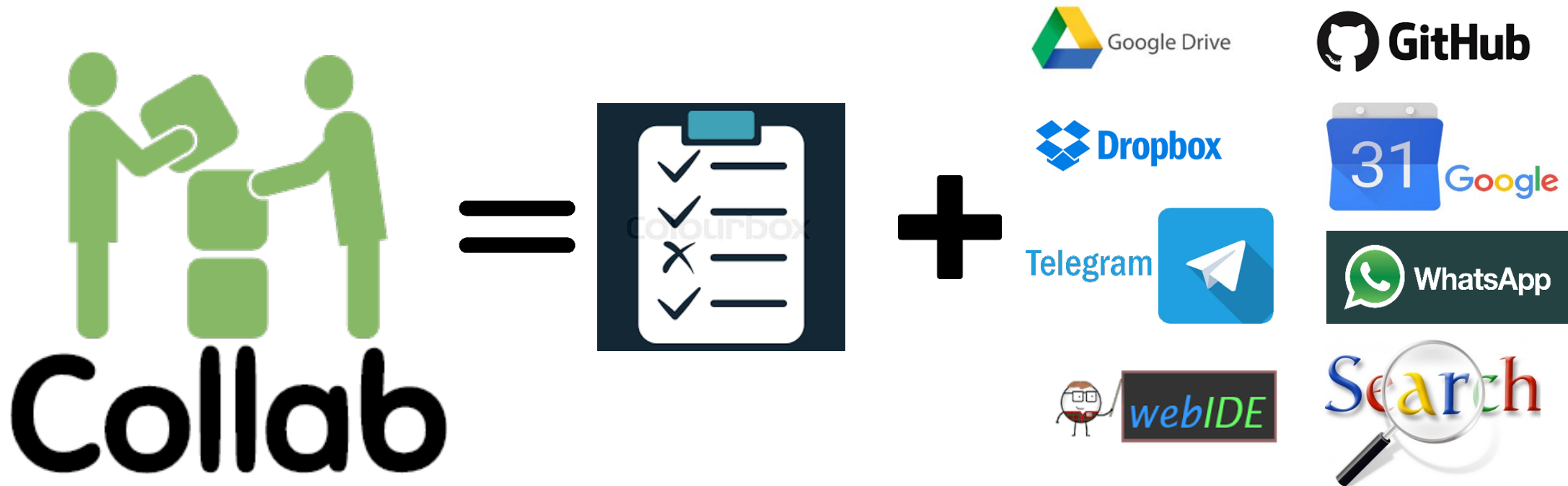


Wish List (Survey from 86 students)

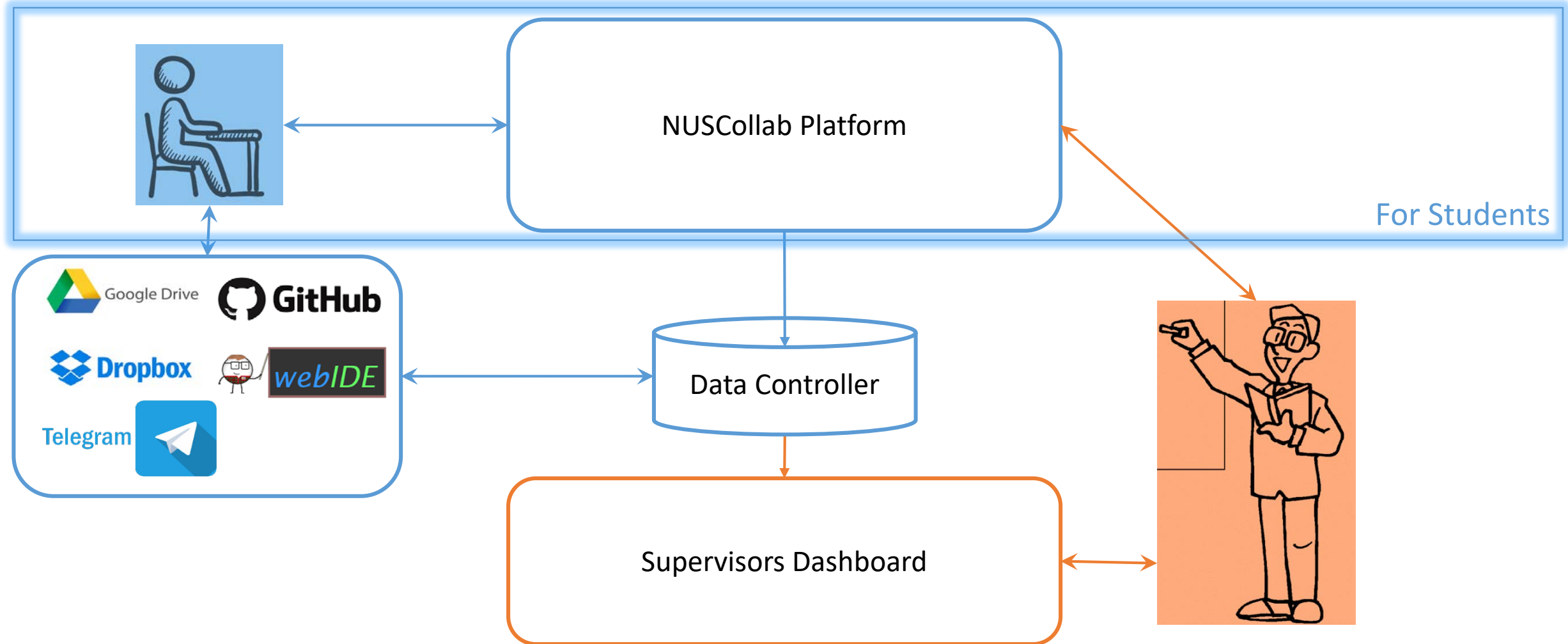


Solution: NUSCollab

- A web platform that combines:
 - Task lists
 - Third-party applications commonly used by students



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Enhancing Authentic Learning

- Achieve and assess the learning objectives in Software Engineering:
 - Enable application of software engineering principles in practice
 - Follow software development life cycle
 - Document project decisions
- Realistic environment for teams
- Enables learning through online interactions
- Allows teachers to give timely feedback on project development

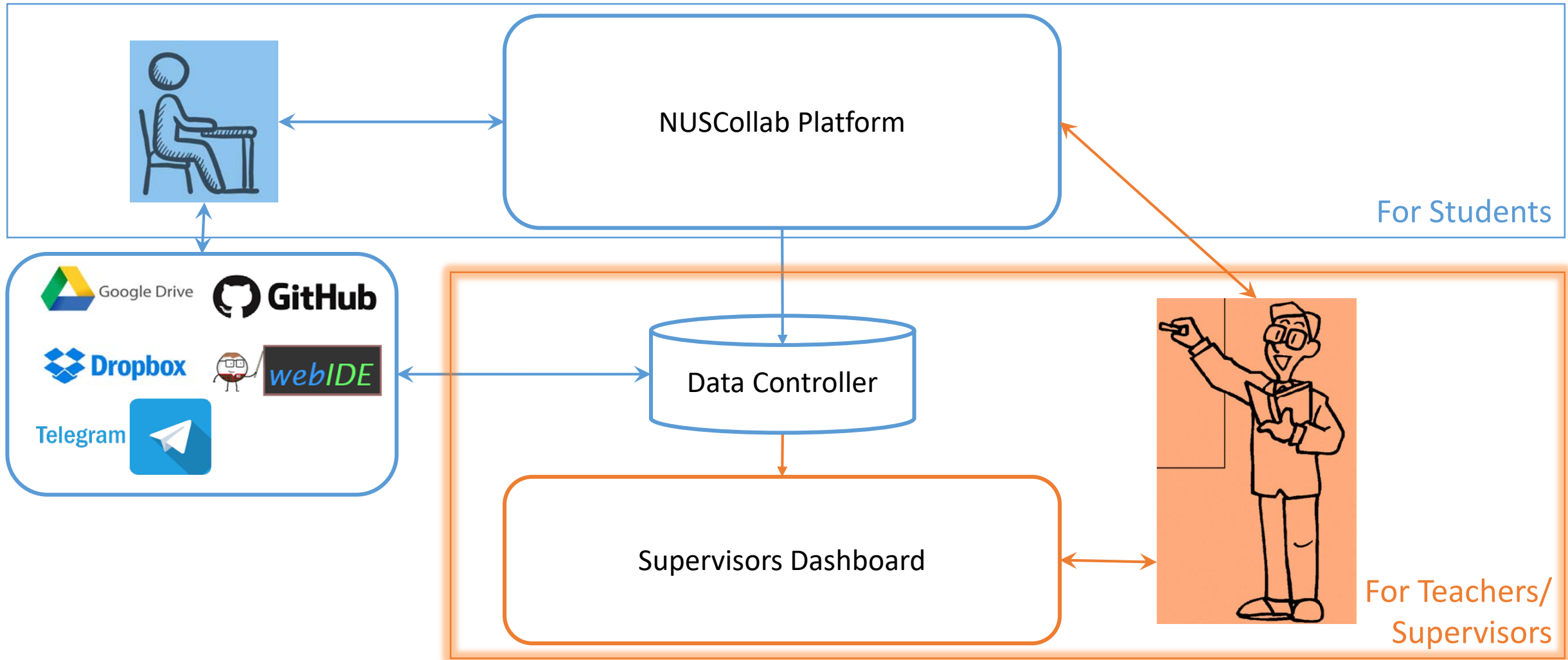
Getting Started

- Login with Google account
- Create your projects
 - Invite the team mates
 - Add milestones and tasks
 - Assign tasks to team members
 - Have discussions related to projects and milestones
- Link GitHub, Google Drive, Telegram, etc.
 - Import issues from GitHub
 - Collaborative editing
- Get notified of activities done by other team members on NUSCollab or linked third party tools

Features for Students

- Centralized view to project related information
 - Create and edit tasks and milestones with deadlines
 - Discussions about the project
 - Code contributions
 - Editing of project documents
- Easy access to project data on third-party tools
 - Code repositories
 - Edit project documents
 - WebIDE for collaborative programming
 - Search through project data

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Supervisors Dashboard: for Teachers

- Monitor progress
 - Compare among teams in a class
 - Compare students in a team
- Send feedback
 - Notifications to identify problematic situations
 - Comment immediately
- Assessment
 - Streamlined assessment
 - Formal and objective analysis of contributions

Per Class Aggregated Metrics

Metric	Definition
Retention Rate	percentage of users who has logged in within the specified time frame
Active Projects	the percentage of projects which are updated within the specified time frame
Feature Utilization Rate	bar chart comparison of feature utilization rate between different features
Total Count for each feature	number of times a feature is created
New Count for each feature	number of times a feature is created within the specified time frame

Per Project Metrics

- Compare progress of different project teams in the same class
 - Identify early teams with poor progress
 - Fast feedback
- Examples:
 - Task completion status within each milestone
 - Completion time of each milestone
 - Milestone deadlines missed
 - Code contribution analysis in third-party VCS tools
 - Edit contributions in third-party editing tools

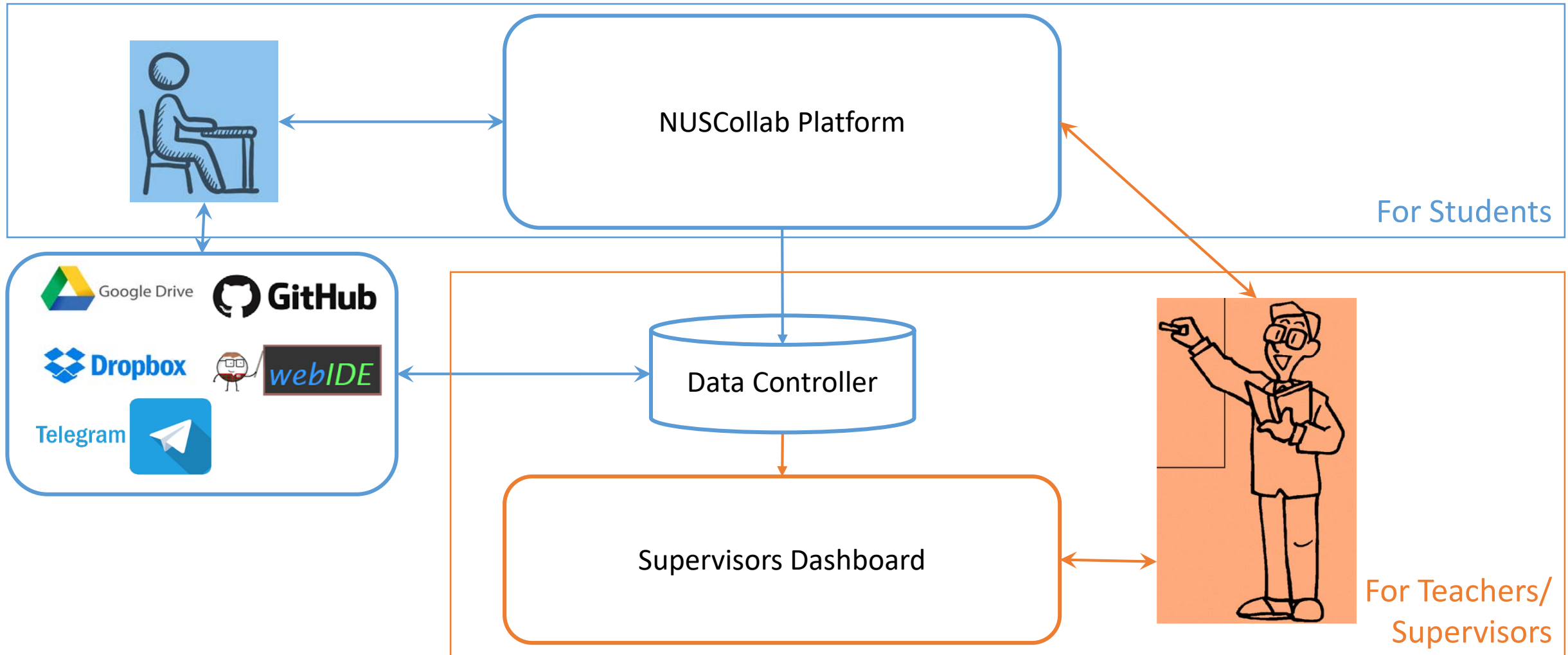
Per Student Metrics

- Compare progress of different students in a team
 - Identify early lack of students progress
 - Feedback and increase support for students that contribute less
- Examples:
 - Task completion status within each milestone
 - Completion time of each milestone
 - Milestone deadlines missed
 - Code contribution analysis in third-party VCS tools
 - Edit contributions in third-party editing tools
 - Participation in discussions

Towards (Partially) Automated Assessment

- Currently, assessment is
 - Manpower intensive
 - Team based with individual components
- Automate assessment based on progress in NUSCollab and contributions in third-party tools: **Dashboard Analytics**
 - NUSCollab: tasks assigned, completed, past-deadline
 - NUSCollab: contributions discussions
 - GitHub: code contributions based on significant interventions
 - Drive: editing contributions in projects files
 - WebIDE: monitor pair programming sessions with team mates

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NUSCollab: Smart Design

- Open Source Frameworks
- Extendable architecture
- Attractive graphical user interface (GUI)
 - Different views – student and supervisor
 - Information is organized under navigation tabs
 - Reduced number of stimuli on a page
 - Filters used to reduce and sort information
- Automated and manually tested

Evaluation

- Testing the platform with selected teams in CS3203 on a voluntarily basis
 - In progress!
 - Adjustments and fixes based on the feedback received
- Three methods to assess the NUSCollab
 - Focus groups at the end of semester
 - Content analysis during task development
 - Perception data in students assessment

Benefits for Students

- Enables **learning through online interactions**
- **Enhances authenticity** of project and team-based learning
 - Directly applicable to CS3203, CS4218, CS2103
 - Any other project-based module
 - Single point of task management for all projects (even individual ones)
- **Aggregation** of commonly used applications
 - Aggregation of files
 - Searchable
 - Holistic view of tasks

Benefits for Teachers

- **Monitor** teams and students
 - Logging of students activities on NUSCollab and third-party tools
 - Identify lack in progress
- Timely **feedback** on project development
- **Assessment**
 - Through metrics in supervisors dashboard

References

- [1] Herrington, A., and Herrington, J., Authentic learning environments in higher education. Hershey, PA: Infosci (2006)
- [2] Herrington, J. and Oliver, R., An instructional design framework for authentic learning environments. Educational Technology Research and Development, 48(3), 23-48 (2000)
- [3] Herrington, J., Authentic E-Learning in higher education: Design principles for authentic learning environments and tasks. World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education (ELEARN), Honolulu, Hawaii, USA pp. 3164-3173 (2006)
- [4] Vygotsky, L. (1978). Mind in society. Cambridge, MA: Harvard University Press. (Original work published in 1930) (1978)
- [5] Vygotsky, L. (1986). Thought and language. Cambridge, MA: MIT Press. (Original work published in 1934) (1986)
- [6] Stan Jarzabek and Pin-Kwang Eng, "Teaching an Advanced Design, Team-oriented Software Project Course", Proceedings of the 26th Conference on Software Engineering Education and Training (2013)
- [7] Damith C. Rajapakse, "Practical Tips for Software-Intensive Student Projects", 3rd edition [Online] <http://StudentProjectGuide.info>
- [8] Robillard, P. "Teaching Software Engineering through a Project-Oriented Course," Proceedings of Conference on Software Engineering Education (1996)

Thank you!

Q&A