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Curb Your Procrastination:

A Study of Academic Procrastination Behaviors vs.. a Planning and Time Management App

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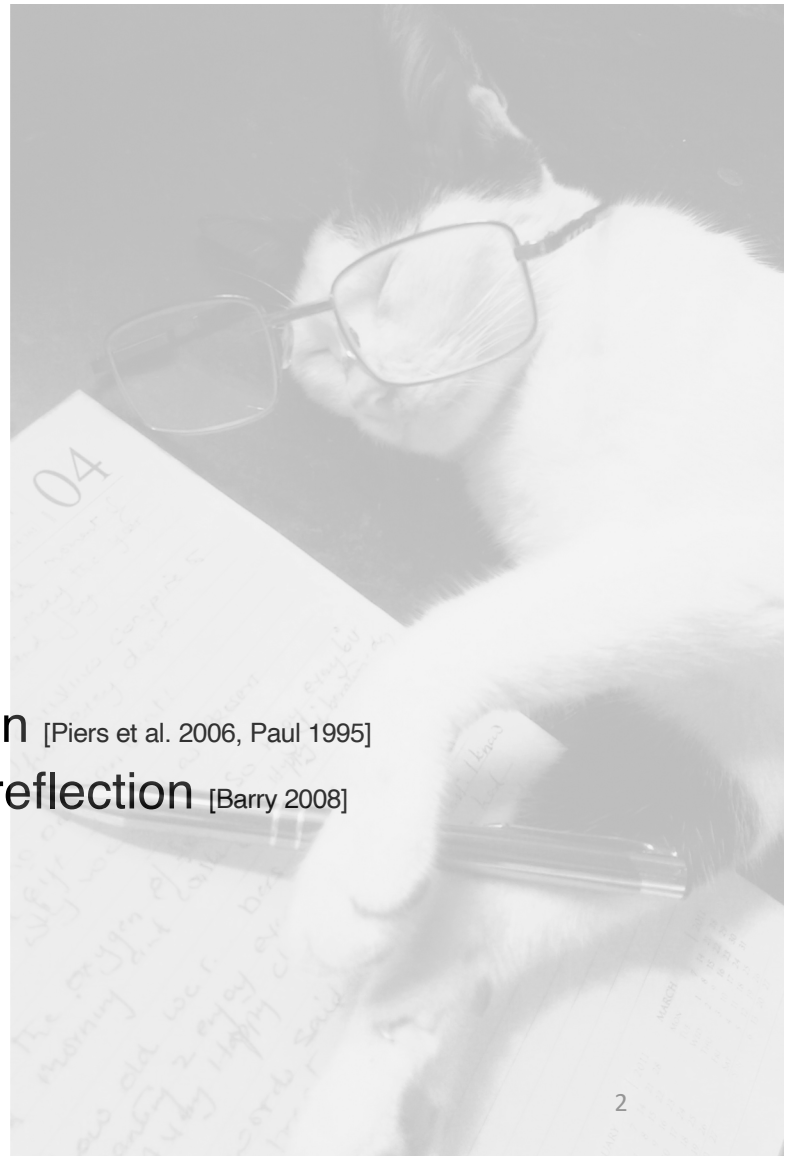
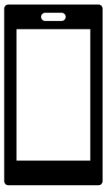
Academic procrastination

- Academic procrastination [Greg et al. 2003, kyung et al. 2015]
  - Voluntarily delaying academic tasks
  - Negatively affect academic performance

- Self-regulated learning (SRL) skills
  - Important factors in academic procrastination [Piers et al. 2006, Paul 1995]
  - Include forethought, performance, and self-reflection [Barry 2008]

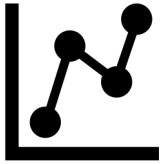


Prior research on procrastination



Apps to address **general** procrastination

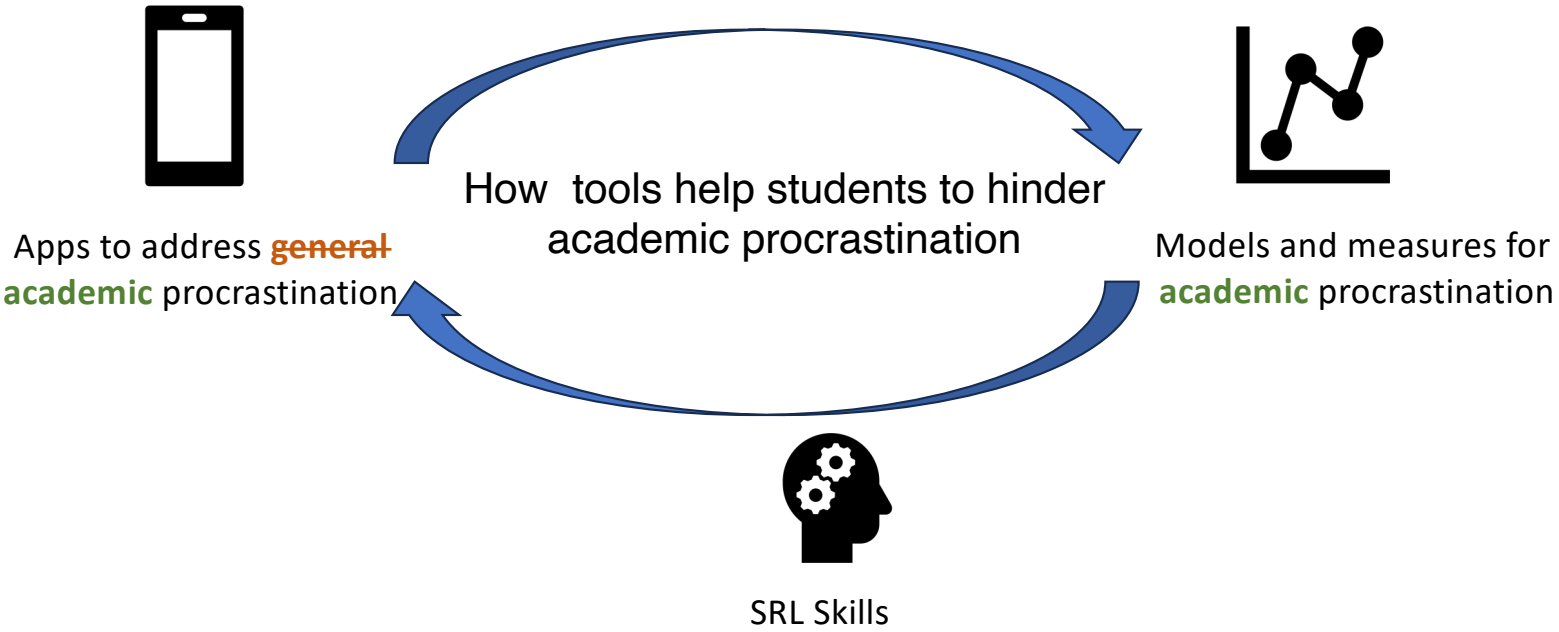
[Christian et al. 2021, Felianne et al. 2019]



Models and measures for **academic** procrastination

[Lalitha et al. 2020, Carlos et al. 2013, Rebeca et al. 2017, Tomas et. Al 2016, Ayanan et al. 2017, Jihyun et al. 2018, Yao et al. 2020, Yao et al. 2021]

What is missing?

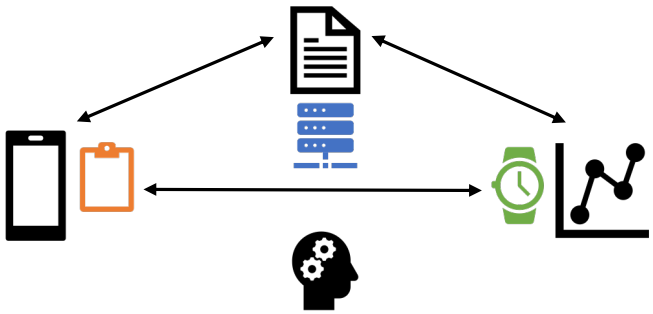


Our study

- Given a mobile application
  - Academic planning and time management app
  - Support self-regulated learning skills

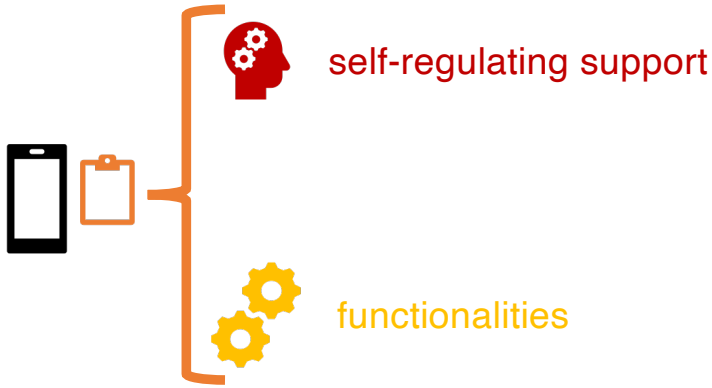
- How do
  - in-app self-regulation support functionalities,
  - in-app student behavior, and
  - procrastination detected by student modeling

  relate to each other?



Our research questions

- **Q1:** Which functionalities/self-regulating support do the students find most beneficial?



Our research questions

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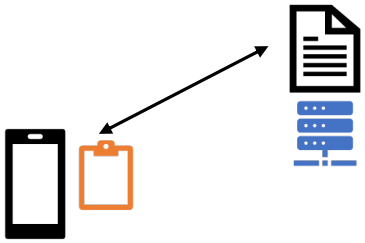
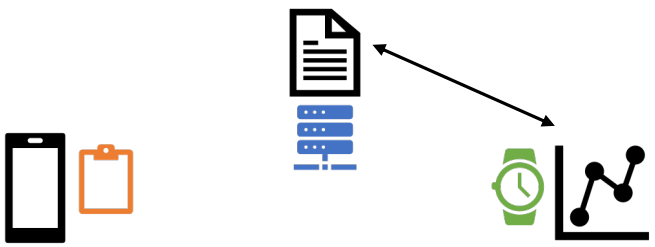


Our research questions

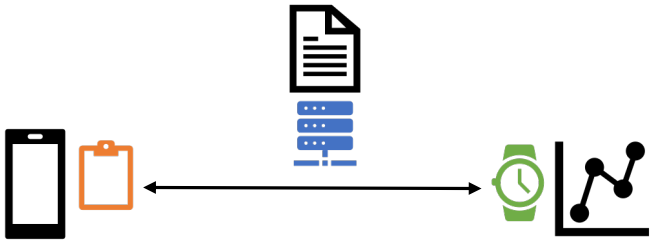
- **Q1:** Which functionalities/self-regulating support do the students find most beneficial?
- **Q2:** Which functionalities/self-regulating support do students with different app-usage behaviors find most beneficial?
- **Q3**: Do the students with more/fewer model-detected procrastination behaviors use the app in different ways?



Our research questions

- **Q1:** Which functionalities/self-regulating support do the students find most beneficial?
- **Q2:** Which functionalities/self-regulating support do students with different app-usage behaviors find most beneficial?
- **Q3**: Do the students with more/fewer model-detected procrastination behaviors use the app differently?

- **Q4**: Do the students with more/fewer procrastination behaviors have a different perception of app functionality/SRL support usefulness?



Our app: Proccoli

- To plan, track, and manage academic tasks
  - Supporting self-regulated learning skills

https://www.albany.edu/proccoli/

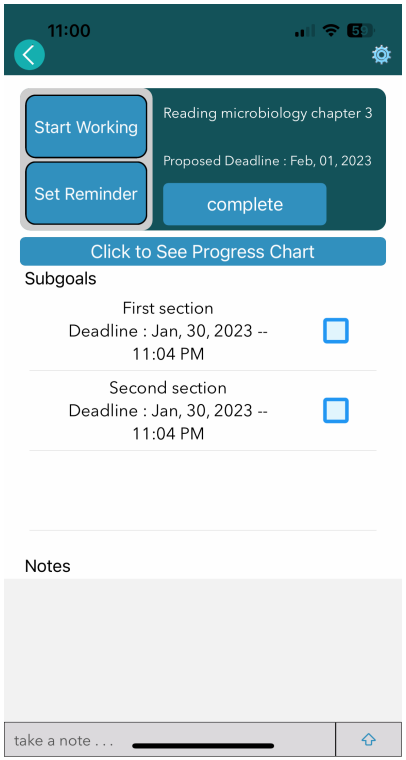
Our app: Proccoli

- To plan, track, and manage academic tasks
  - Supporting self-regulated learning skills

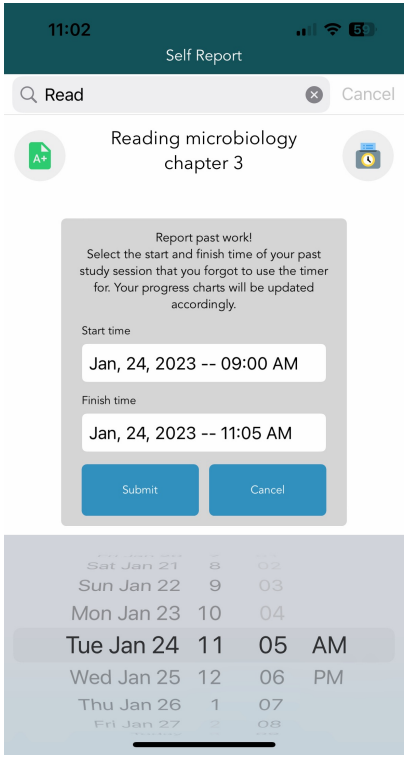
- Functionalities include:
  - Goals/subgoals setting,
  - Pomodoro Timer,
  - Progress chart,
  - Performance reporting,
  - Group goal setting, ...

https://www.albany.edu/proccoli/

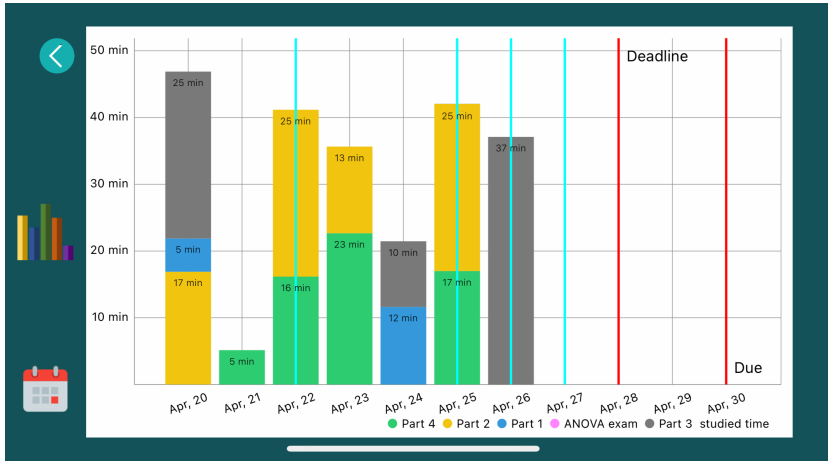
Some Proccoli functionalities



Individual wall/editing

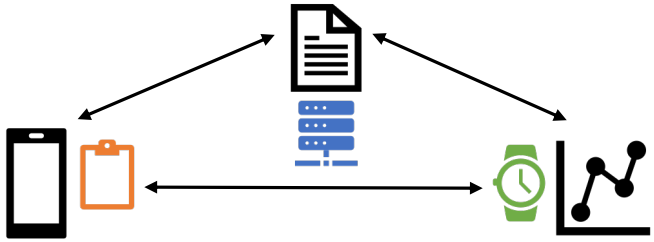


Progress reporting



Progress Chart

Dataset



- Evaluation Survey
  - Assess students' experience of Proccoli
- In-App Usage Point Statistics
  - Identify student usage patterns of Proccoli
- Timed Studying Activity Data
  - Model the continuous student procrastination behavior dynamics

Dataset - Evaluation Survey

- Designed 37 questions, on
  - Proccoli functionalities,
  - Prococoli's SRL support

- Six SRL support evaluated in Prococoli [Ozok 2007]
  - Time management awareness
  - Plan and execute,
  - Motivation,
  - Perceived accountability,
  - Perceived support, and
  - Social accountability.

Dataset - Evaluation Survey

- 38 completed survey responses out of 201 past student users

Q#	question	response options	functionality	SRL support
Q1	In general, using Proccoli was convenient for me.	Likert scale 1-5	overall application	overall Satisfaction
Q8	**Creating a goal** in the application makes me feel more **motivated** to complete that goal	Likert scale 1-5	goal/subgoal setting	motivation
Q26	Viewing the **progress chart**, which displayed proposed study time and actual time studied, did NOT help me to **manage my time**.	Likert scale 1-5	progress charts	time management awareness
Q32	Receiving **notifications** to use Proccoli made me **feel** (select any number of feelings that apply to you)	multiple-choice feeling	notification	perceived support

sample survey questions

Dataset - In-App Usage Point Statistics

- Defined 18 point measures
  - Summarize student in-app studying behaviors

features	#users available	Mean	Variance	median
#goals	33	18.03	943.22	9
Finish Rate	33	0.68	0.17	0.99
Studied Time	24	4.60	143.92	1.19
Self Evaluation	27	3.92	0.78	4.07
Grades	13	11.17	2.47	12
Timer Usage	31	0.28	0.075	0.25

sample in-app usage point statistics

Dataset - Timed Studying Activity Data

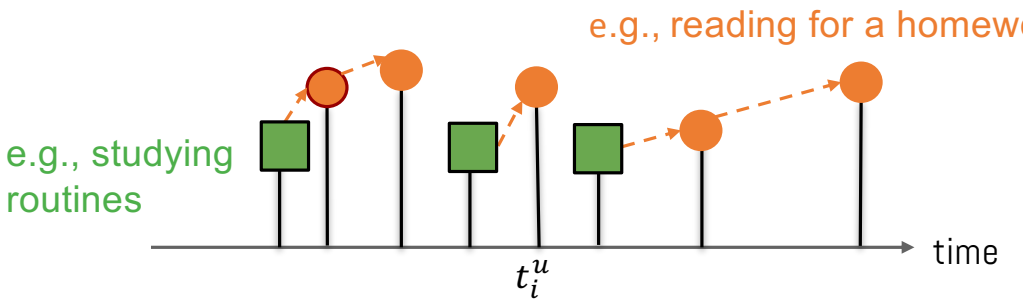
- Data on the timing of students' **studying activities**
  - For modeling student procrastination dynamics using Hawkes process

- Four types of activities with Unix timestamps
  - Goal creation time
  - Time of student interactions with the built-in pomodoro timer for studying
  - Self-reported study time
  - Goal completion time

Dataset - Student Procrastination Modeling

- Modeling Procrastination by Hawke Process [Yao et al. 2020, Yao et al. 2021]

Given collection of timed activities of a student: $S^u = \{t_1^u, \dots t_i^u, \dots t_{L^u}^u\}$



Intensity function:

$$\lambda(t|S^u) = \mu^u + \sum_{t_i^u} \alpha^u \beta^u e^{-\beta^u (t - t_i^u)}$$

External: base rate

Internal: self-excitement rate & decay

Dataset - Student Procrastination Modeling

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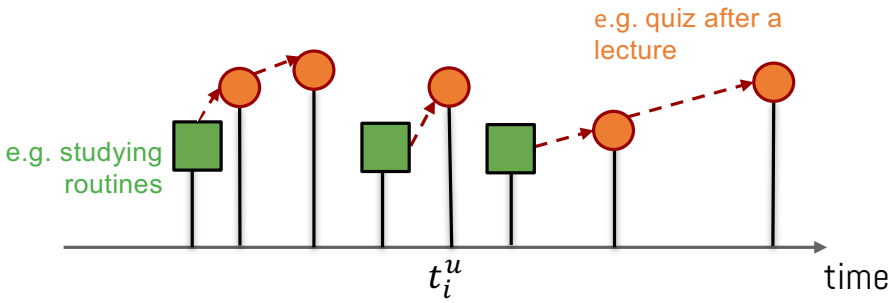


Intensity function: $\lambda(t|S^u) = \mu^u + \sum_{t_i^u} \alpha^u \beta^u e^{-\beta^u (t - t_i^u)}$

Base rate

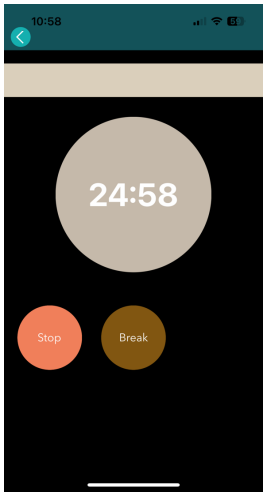
Self-excitement rate & decay

We learn $H^u = (\mu^u, \alpha^u, \beta^u)$, where

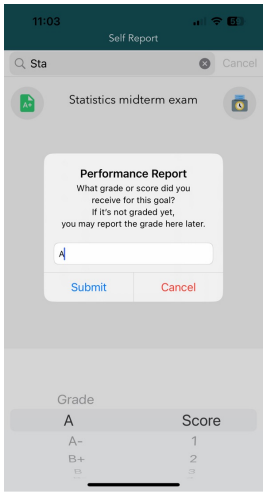
- μ^u: expected rate of activities for student u triggered by external stimuli (e.g., deadline)
- α^u: individualized expected rate of activities self-excited by previous activities (i.e. bursty)
- β^u: decaying influence of self-excitement by prior activities for student u (period of influence of past activities)

Q1 - Evaluation Survey: best functionalities

Timer



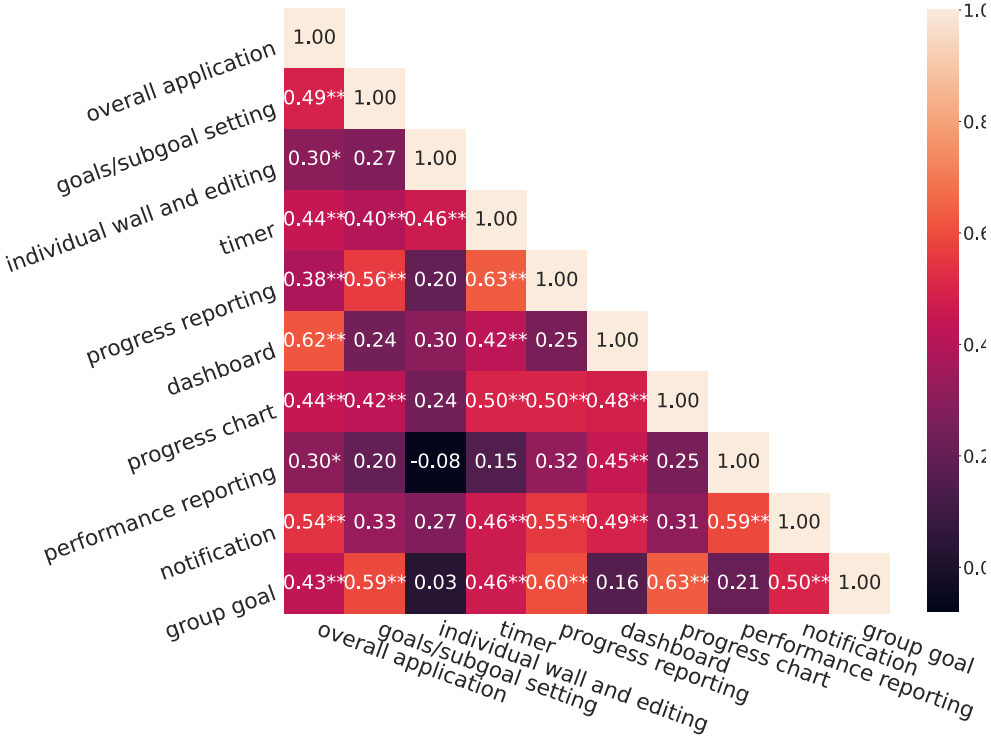
Performance reporting



Category	response mean	response variance	response median
Overall application	3.2434	0.3496	3.5
Goals/subgoal setting	3.2897	0.1195	3.2857
Individual wall and editing	3.2594	0.2166	3.1667
Timer	3.8788	1.4848	4
Progress reporting	3.0625	1.5444	3
Dashboard	3.2793	0.2007	3.3333
Progress chart	3.2564	0.0916	3.3333
Performance reporting	3.7358	0.9791	4.0833
Notification	3.4438	0.7536	3.5
group goal	3.2174	0.9733	3

Q1 – Association between functionalities

- Students' perceptions of functionalities and *overall* app are consistent
  - *All functionalities* vs. *Overall application*
    - Many functionality correlations (some are significant)



Q1 – Evaluation Survey: best SRL support

- Proccoli is effective in supporting **most** self-regulated learning
  - *Overall*
  - *Perceived support*
  - *Time management awareness*
- But not all students are happy with the same SRL support; high variance in
  - *Perceived support*
  - *Social accountability*

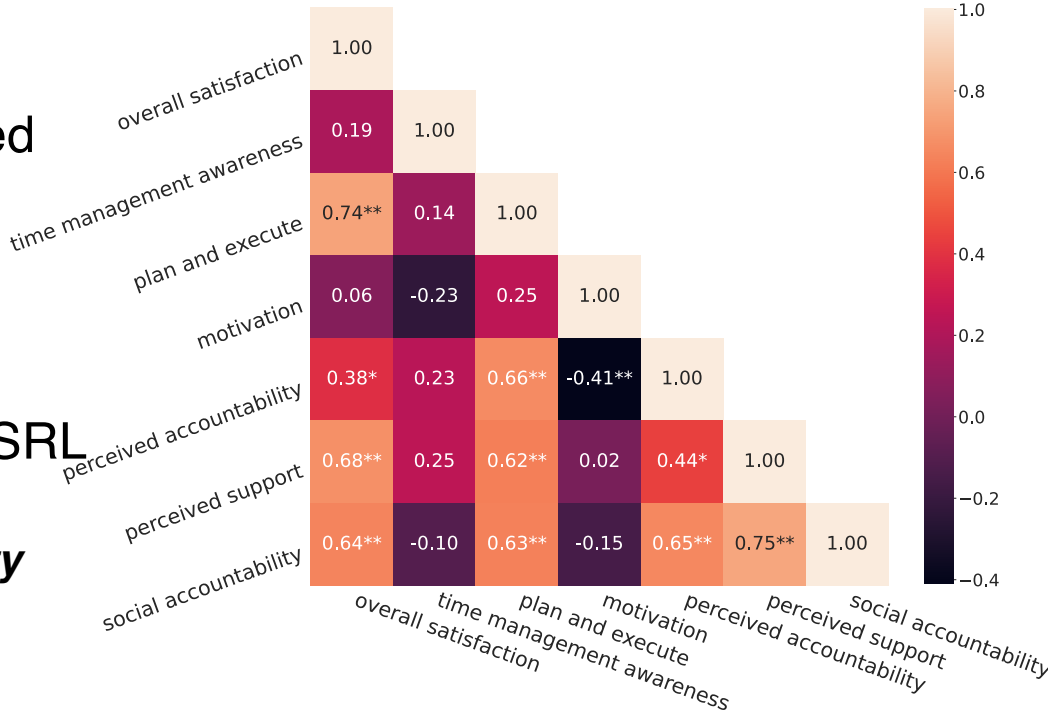
Category	response mean	response variance	response median
Overall satisfaction	3.5175	0.821	3.6667
Time management awareness	2.8712	0.1294	2.8333
Plan and execute	3.369	0.1749	3.375
Motivation	3.0147	0.2119	3
Perceived accountability	3.2826	0.2915	3.25
Perceived support	3.5069	1.0053	3.7292
Social accountability	3.2647	0.9099	3

Q1 – Association between SRL supports

Students' perception of the *Overall Proccoli* and individual SRLs are aligned

- Many SRL vs. *Overall satisfaction*
  - Significant except for ***motivation*** and ***time management awareness***

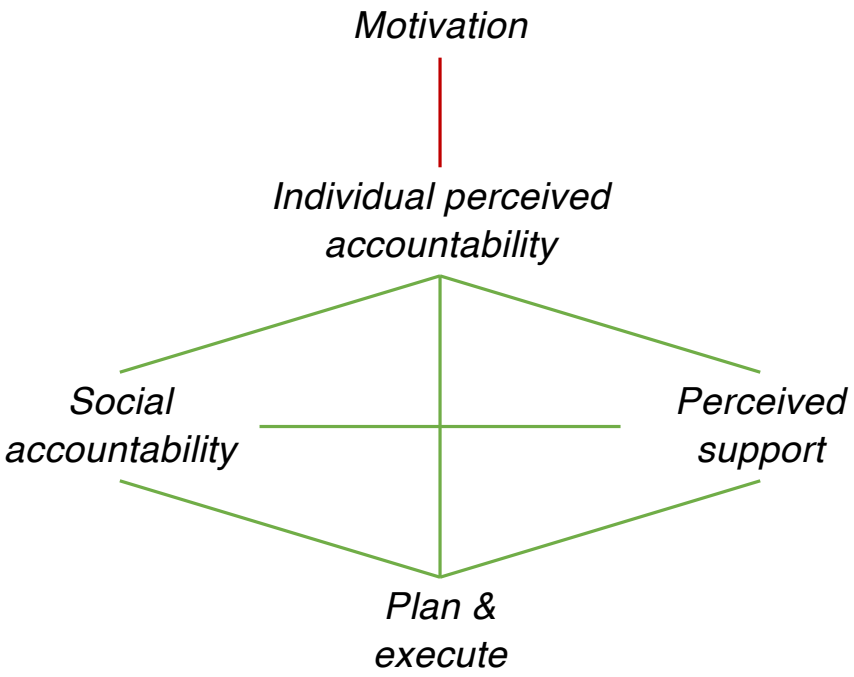
- Students show varied satisfaction of SRL support:
  - ***Motivation*** vs. ***perceived accountability***

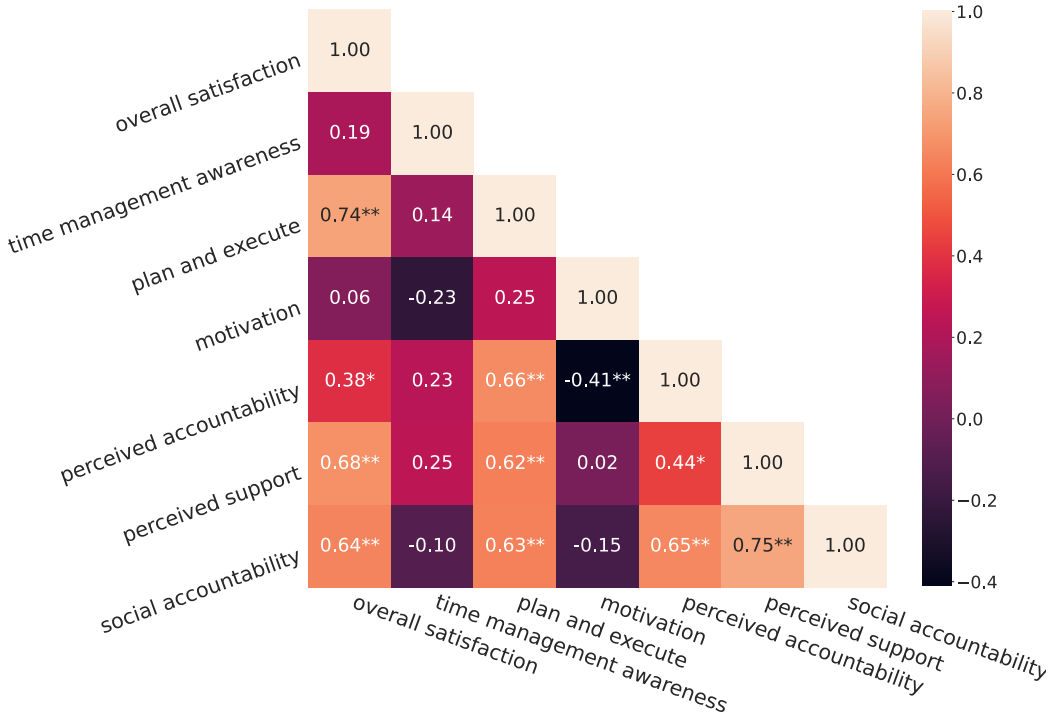


Q1 – Association between SRL supports

Individual perceived accountability is important

- has most # of significant correlations





Q1- Summary

- Students like timer and performance reporting, but not progress reporting

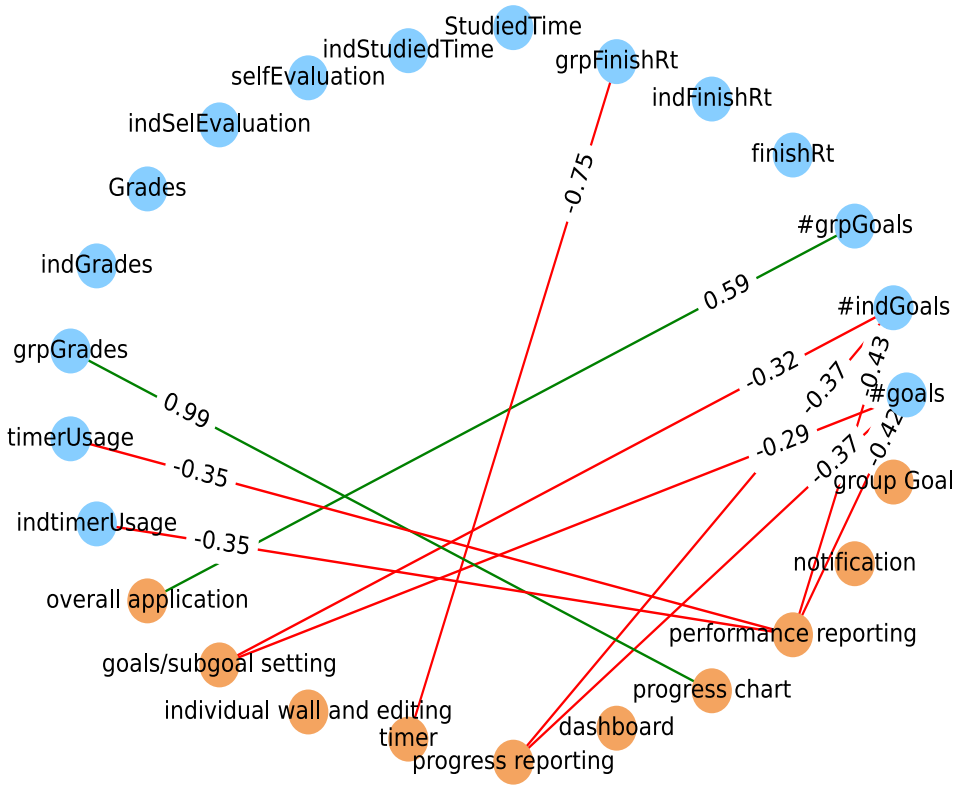
- Students were not satisfied with how Proccoli made them *aware of their time-management* practices, but felt supported in *planning* for their studies and helping them to complete their tasks

- While planning, accountability, and support are positively related, motivation goes against individual perceived accountability

Q2- Evaluation Survey (functionalities) vs. In-App Usage Stats

- Students who create less goals, are more satisfied of some functionalities
  - *#goals* & *#indGoals* vs. *goals/subgoal setting*, *progress reporting*, *performance reporting*
    - enough expertise of these functionalities and don't see need of using them? cumbersome design?

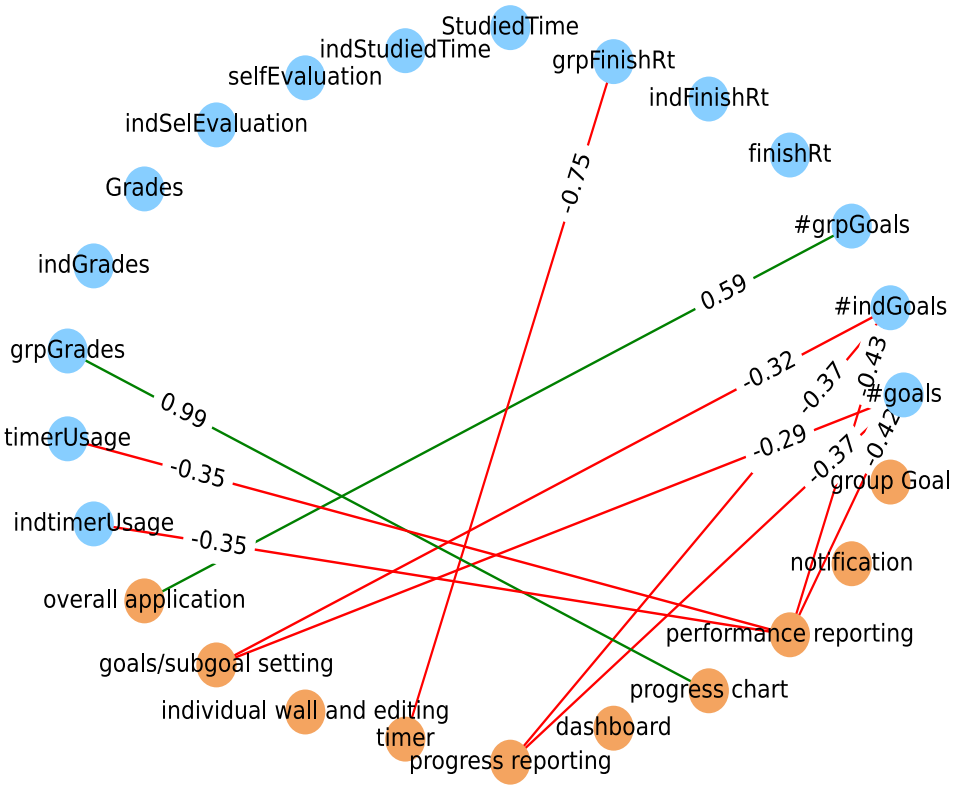
- Timer is not well-suited for collaborative learning
  - *grpFinishRt* vs. *Timer*



Q2- Evaluation Survey (functionalities) vs. In-App Usage Stats

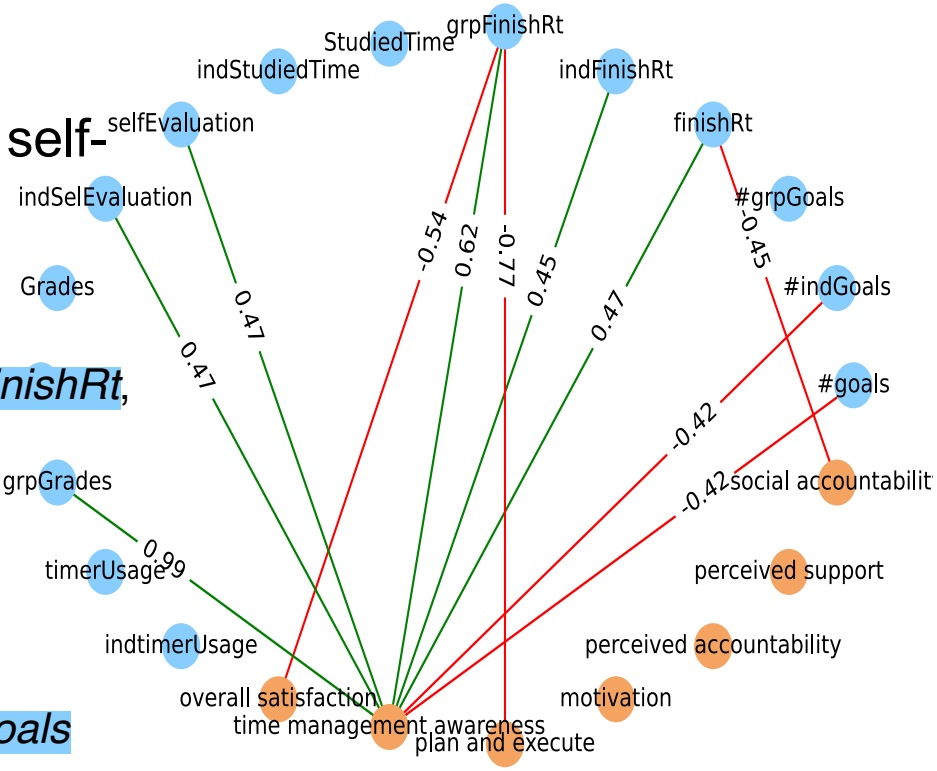
- Students who are engaged w. group activities, find value in *progress visualization* and the *overall* app

- *groupGrades* vs. *progress chart*
- *#groupGoals* vs. *overall application*



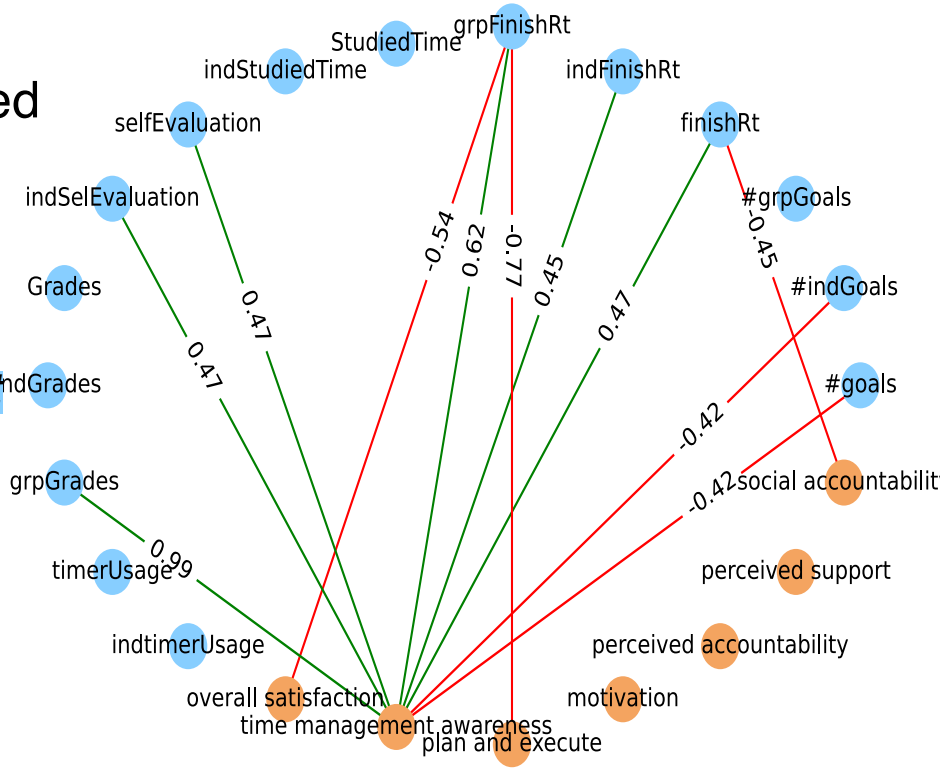
Q2- Evaluation Survey (SRL) vs. In-App Usage Stats

- More proficient at finishing goals & higher self-evaluation: Proccoli informs their time management practices
  - *time management awareness* vs. *finishRt*, *indFinishRt*, *grpFinishRt*, *selfEvaluation*, *groupGrades*, *indSelfEvaluation*
- But, more goals: less informed of time management practices
  - *time management awareness* vs. *#goals*, *#indGoals*



Q2- Evaluation Survey (SRL) vs. In-App Usage Stats

- More proficient at *finishing group goals*: used Proccoli to **manage** their time **rather than planning**
  - *plan and execute* vs. *groupFinishRt*
  - *time management awareness* vs. *groupFinishRt*
- More proficient at finishing goals: Proccoli doesn't inspire social accountability
  - *social accountability* vs. *finishRt*
  - higher intrinsic motivation?



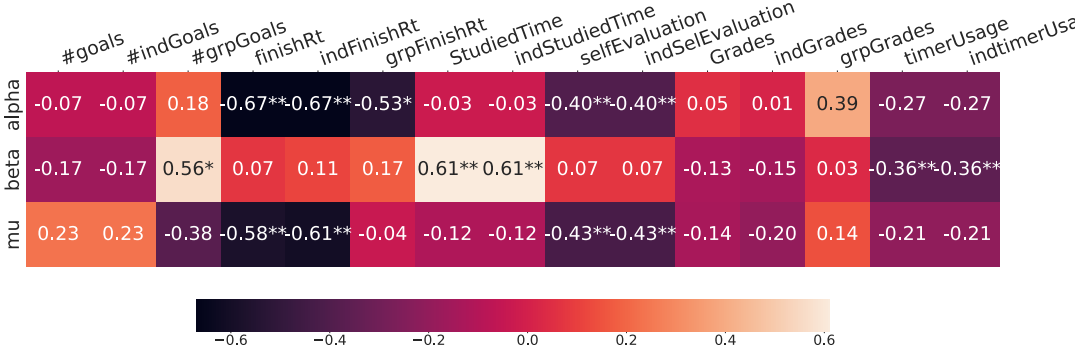
Q2- Summary

- The need for personalized SRL support
  - Better time management awareness for students with less finish rate and lower self evaluation
  - Less need of social accountability for students with high finish rate
- The need for task-dependent SRL support
  - Unlike individual goals, Proccoli helps in in managing time for students with high group finish rate, but not as much in planning
- The need for task-dependent functionality support
  - Progress chart for group goals and timer for individual goals

Q3- In-app Usage Point Statistics vs. Hawkes Procrastination Model

- More bursty procrastination-like patterns or triggered more by the external stimuli: lower goal finish rate and self-evaluation
  - α vs. *finishRt*, *indFinishRt*, *grpFinishRt*, s*elf-Evaluation*, and *indSelfEvaluation*
  - μ vs. *finishRt*, *indFinishRt*, *selfEvaluation*, and *indSelfEvaluation*

- Long-lasting effect from prior activities on creating follow-up activities: higher use of timer to study in short time periods
  - β vs. *#grpGoals*, *studiedTime*, and *indStudiedTime*
  - β vs. *timerUsage* and *indTimerUsage*

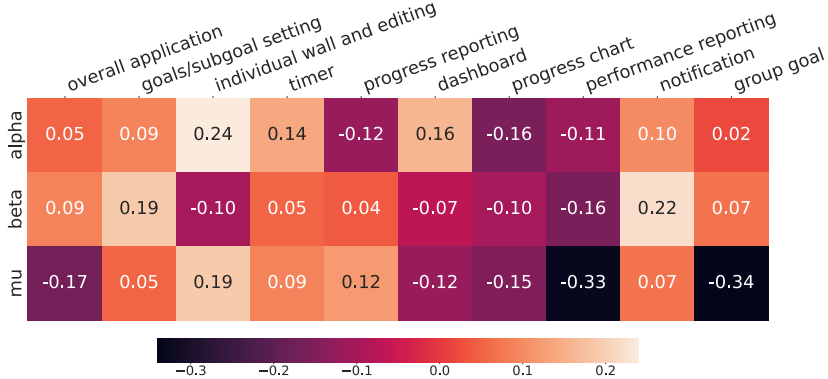


Q3- Summary

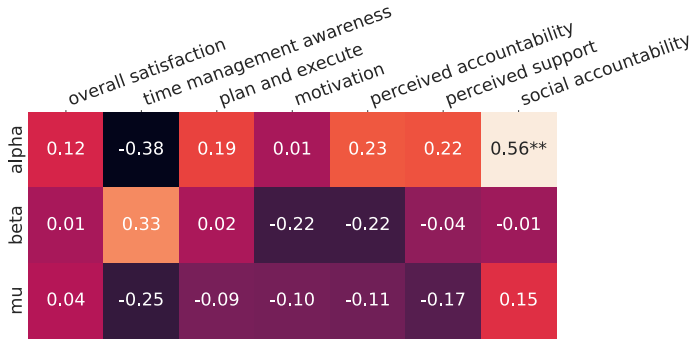
- Students with different app usage have different procrastination-like behaviors
  - More frequent and short-spanned timer usage is associated with long-term planning
  - Higher finish rate and self evaluation is related to less procrastination-like behaviors

Q4- Survey Response vs. Hawkes Procrastination Model

- **No** significant correlation between Hawkes parameters vs. functionalities



- Students with more bursty procrastination-like behaviors: Proccoli inspires social accountability
  - α vs. *social accountability*



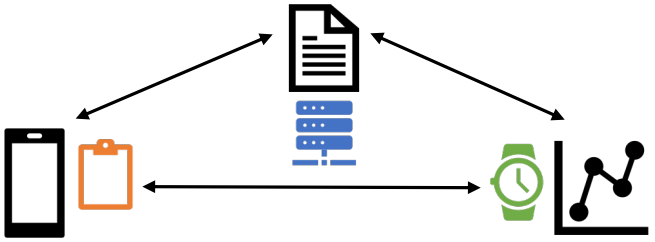
Q4- Summary

- How the students perceive Proccoli's functionalities is not directly related to their procrastination-like behaviors

- But, there is a need for personalized SRL support based on student procrastination-like behaviors
  - Students with more procrastination-like behaviors report seeing peers' list of completed/expired goals motivates/discourages them to complete their goals on time

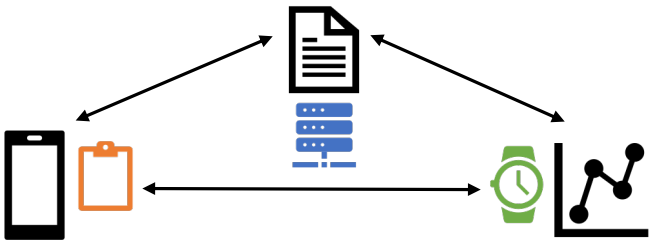
Conclusions: the need for more/better support

- Proccoli's *Timer* and *Performance Reporting* were the best functionalities, but it needs better design in other functionalities (Q1)
- Overall, Proccoli helps in *planning goals* and a*chieving* them, but not in *managing time* (Q1)
- Providing better *social accountability* support could potentially increase goal completion rate (Q2)



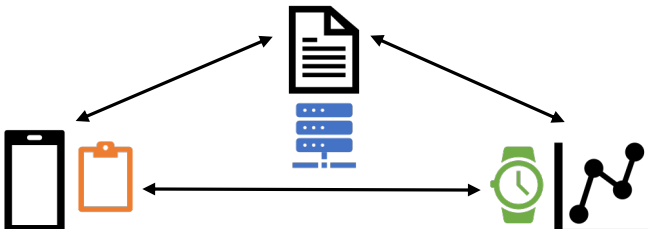
Conclusions: the need for task-dependent support

- Although majority of students were satisfied with Planning support rather than Time Management (Q1), the ones more proficient in *finishing group goals* benefitted more from *Time Management* (Q2)



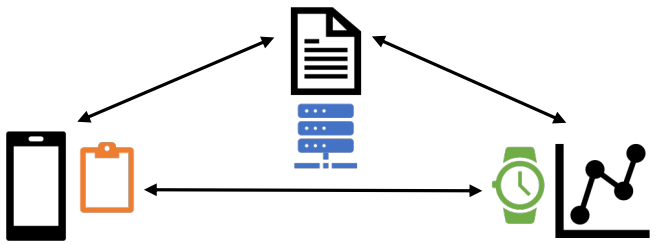
Conclusions: the need for personalized support

- Different students can benefit from different SRL support functionalities (Q1)
- Students with different procrastination behaviors use Proccoli differently (Q3) but they don't perceive the functionalities differently (Q4)
- While *Motivation* and *Social Accountability* are not generally related (Q1), students with less proficiency in *finishing goals* are more inspired by *Social Accountability* (Q2)
- Students with more *procrastination-like behaviors* and lower *self evaluation* (Q3) would benefit from social accountability SRL support (Q2, Q4)



Future work

- Proccoli needs to improve in self-regulation skills, e.g., *time management awareness*
  - E.g., notification, calendar
- Personalized time management awareness support to help students with different learning behaviors
- Use of social accountability to motivate students with procrastination-like behaviors



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Thank you!
Q & A

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Our code and supplementary material are available at GitHub: https://github.com/persai-lab/2023-UMAP-CurbYourProcrastination-SurveyAnalysis