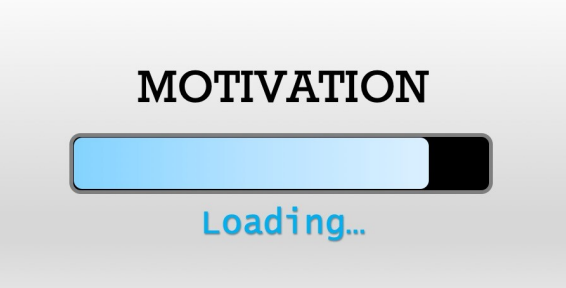

Occidental College Senior Comps

Improving Study Motivation with a Socially Oriented Time Tracker

Dylan Morison

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Contents

1 Introduction

1.1 Motivation

In the modern day many people use fitness trackers as motivational tools to exercise. Between 2019 and 2020 the popularity of fitness watches, for instance, has skyrocketed. In the United States approximately one in five people own and regularly use fitness watches to track exercise.[1] The huge rise in popularity of fitness watches can be attributed to one simple fact: it is extremely important for people to exercise to live a healthy life, however it is not always easy to find motivation to exercise. Thus, fitness watches allow people to both have access to workout instruction, and more clearly see the benefits of exercise (via calories burned, daily steps, miles traveled, etc...).[2]

Clearly, people around the world have benefited greatly from the introduction of fitness watches into the world's economy. A combination of excellent software, hardware, and user-interface systems have allowed people to be more motivated to exercise. Exercise, however, is only one of many different beneficial aspects of life worth being motivated to participate in. Another very important component of a successful life is the ability to spend sufficient time studying. Having good study habits leads to individual development both in academia and in life. [3] Interestingly, studying shares two important attributes with exercise. First, it is clear studying is beneficial for personal growth and development. Second, studying diligently can require a decent amount of motivation. Is it then possible that one could create a device or application that could allow people to find motivation to study? In other words, can fitness motivation devices be altered to track and motivate study good study habits instead of good exercise habits?

1.2 The Theory of Study Motivation

Taking motivational components of fitness trackers and implementing them into motivational study components may not be as hard one would make it out to be. At its very core, fitness motivation involves tracking fitness. As such, the core component of study motivation should ideally be very similar. Anybody who wants to motivate themselves to do any task should theoretically find some level of motivation through being able to examine their progress over time. At this point, it is reasonable to respond to this assertion by questioning the validity of whether or not increased ability to track progress actually results in higher levels of motivation.

Two important factors lead to the conclusion that motivational time tracking

[1] Pew Research Center: https://www.pewresearch.org/

[2] https://www.runnersworld.com/news/a28613768/fitness-tracker-benefits-study/

[3] Lammers, W. J., Onweugbuzie, A. J., Slate, J. R. (2001). Academic success as a function of gender, class, age, study habits, and employment of college students. Research in the Schools, 8(2), 71–81.

will result in increased study motivation. First, statistics and the success of fitness trackers alone show the significance of progress tracking. Second, many studies reveal that humans benefit greatly from recognising small increments of progress.[4] One of the most significant findings from these studies is the *progress principle*. The progress principle states that the most significant source of long term motivation is progress. This is to say that in any long term endeavor, whether it be attaining a degree or a high school diploma, is significantly motivated by incremental experiences of progress. These findings are arguably very logical. If we break down a big goal to a lot of little goals, we can clearly observe our progress much more intuitively. We can then be reassured that a substantial amount of evidence exists to support the usefulness of a motivational time tracker for studying and working. However even with this realization, the only way to surely determine the question of validity with regards to progress tracking and motivation is to build a progress tracker and evaluate its usefulness! So far the phrases "motivational time tracker" and "progress tracker" have been mentioned a significant number of times in a hypothetical sense. Formally, a "progress tracker that (hopefully) increases motivation to work" directly references a website that gives users the ability to track the time they spend working on different activities. Activity is used as a general term to describe anything from academic subjects to specific occupations or jobs. Next, we examine the technology behind the proposed web application.

1.3 Progress Tracker Technology

For the remainder of section 1 we will introduce and discuss a very powerful set of tools one can use to create a full stack web application. First, we begin by answering the question: what is meant exactly "full stack"? By definition, a full stack web app refers to a website on the internet that includes both a *front end* and a *back end*. A front end is responsible for every single visual element displayed on a website. On the other hand, a back end is responsible for communicating information to and from the front end. The back end usually contains a database and a server to both store information, and handle incoming requests from the front end.

1.3.1 The Front End: React Js

One of the most popular and widely used libraries for front end web development is known as React. React is a JavaScript library created by Facebook. Although React js was officially launched in 2013, its production began as early as 2010. The need for a library like React was a result of the increasing complexity that Facebook apps inherited as more features and components needed to be maintained. This increased complexity forced Facebook to continuously hire software engineers

[4]The Progress Principle: Using Small Wins to Ignite Joy, Engagement, and Creativity at Work, 2011, Terresa M. Amabile and Steven J. Kramer, Publisher : Harvard Business Review Press; 1st Edition (July 19, 2011)

to maintain its applications on a variety of different platforms. As a possible solution to this issue a software engineer by the name of Jordan Walke created a prototype solution to the growing problem with software maintenance at Facebook.[5]

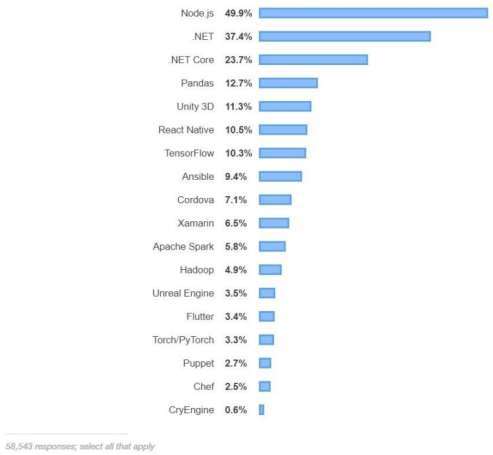
Walke sought to give front end web developers an easier time handling data. Specifically, he designed React to handle non static data, or data that would change in shape or quantity quite drastically. The name "React" actually refers to the ability of the framework to adapt to incoming data efficiently. This means that a developer can efficiently render the correct component on the front end depending on incoming or outgoing data. Furthermore, React does more than simply give developers an easier time constructing the front end. React actually allows users to have smoother experiences while using complex front ends. It would only take a couple years for React to become an international sensation for web developers.

In 2013 React was officially revealed by Jordan Walke and was crucially made open source.[6] The reception of React js was in many cases not optimistic, however this would soon change in 2014 when React began gaining attention of big companies like Netflix. As more features and support were added to React, a larger percentage of the software development community began to embrace it. This momentum drastically increased in 2015, and hasn't shown any signs of slowing since. This is largely due to the birth of React Native, which allowed developers to have both IOS and Android support using the same Javascript base. This aspect of React was revolutionary and led to many well known companies such as Twitter and Airbnb to hop on the React train. Numerous other tools were constructed to further the usefulness and popularity of React, such as React Developer tools, the React canvas, and most notably, *redux*. Between 2016 and 2019 many more features of React were introduced and maintained but 2015 marked the year React became mainstream. Since 2018, React has ranked in the top 3 frontend JavaScript frameworks by a huge margin due to its ability to maintain complex and dynamic data. [7]

1.3.2 The Back End: Node js

Similar to React, Node Js has become one of the most popular run-time environments since its initial release in 2009. According to Stack overflow's developer polls, Node has been the most popular web application framework since 2017.

[5]https://www.youtube.com/watch?v=KVZ-P-ZI6W4t=0slist=PLb0IAmt7-GS1cbw4qonlQztYV1TAW0sCrindex=
[6]https://www.youtube.com/watch?v=GW0rj4sNH2w
[7]https://insights.stackoverflow.com/survey/2018/most-loved-dreaded-and-wanted



Technically speaking Node Javascript, commonly refered to as Node, is a back-end run time environment that allows the JavaScript language to be implemented outside of web browsers. One huge advantage of using Node is the simple fact that it is implemented using JavaScript. The significance of this fact has to do with the nature of JavaScript's non-blocking design. That is, while many programming languages contain asynchronous features, JavaScript is generally highly adept at handling asynchronous operations. The reason this is so advantageous for back end related code is that back ends typically need to make asynchronous requests to other servers, databases, and the front end. Thus, the popularity of node js can be attributed to its non-blocking single threaded model.

Clearly Node is very powerful due to the fact that it is inherently an asynchronous platform. Before moving on to the next section, we must further develop this concept for anyone who doesn't have experience or knowledge relating to asynchronous operations. First, consider a code file that contains 100 *synchronous* lines of code. If one were to run this hypothetical file each line would be run in order from line 1 to line 100. What makes this code "synchronous" is the property given an integer x, such that $1 \leq x \leq 99$, then code at line $x + 1$ would not be able to run until the code at line x finishes. On the other hand, if we have a 100 line file of *asynchronous* code this property no longer applies. The code in the asynchronous file will still start at line 1 and finish at at line 100, but the code at line $x + 1$ can run even if the code at line x hasn't finished. Thus, any back end with this asynchronous property is extremely powerful.

The reason a back end with this asynchronous property is extremely useful is because it may contain many lines of code that will only finish execution once information has been successfully sent or received from some other internet resource, such as a database, an API, or another back end server. Since making any request over the internet takes time, it is extremely advantageous to not block the execution of code that will have quick execution time with code that could take an undetermined amount of time to execute. And since Node has this asynchronous property, it is highly adept when used as the back end of a website.

1.3.3 Combining The Front End & Back End

By now it is hopefully clear that there are many advantages to using React and Node to build a modern web app. However a hidden challenge to any full stack web application is not simply in learning how to build a front end, or build a back end. Rather, the challenge is finding a way to combine front-end (React) components with the back-end (Node) components. While a professional software developer could theoretically accomplish this task using tools native to node js and React, in actuality this is rarely the case. Instead a developer would make use of a multitude of existing libraries to better allow them to manage data between every component of the application. In the case of a project build with React and Node, the essential libraries used would most likely include Express, Mongoose, Passport, Redux, Axios, react-router-dom, GoogleAuth, cookieSession, socket.io, and many other libraries.

After all, Node is not a web framework, or some kind of native back end. Node is just a JavaScript environment that exists outside the browser. So if a developer wants to start receiving and sending data from a front end, they might use a library called express to easily set up back end addresses to send and receive data. If a developer wants to set up authentication with a google account they would make use of Node libraries such as passport or GoogleAuth. On the other hand, if a developer wants to manage data in a React application, they would use data management libraries such as Redux. The ways to modify React and Node are seemingly endless, and thus the ways to create a full stack web application are abundant.

2 Methods

2.1 Methods Intro

This section will present the reader with a semi technical overview of the construction of a motivational time tracker from start to finish. There are 5 major components that will be discussed in detail:

- Sending, storing, and receiving information from a Database.
- User Creation, Authentication, and Maintenance.
- A feature that allows users to create and track different activities.
- A feature that allows users to create and track goals relating to activities.
- A feature that displays users who are currently online and active.

Whereas the first two features are specific to full stack web development, the last three are specific to the implementation of a motivational time tracker introduced in this paper.

2.2 Sending, storing, and receiving information from a Database

We begin with a discussion regarding a very important component of web applications that we've yet to really touch on thus far. Any complex web app needs to be able to remember important information information to maintain functional and usable. This is where databases come into play. A database stores information in an organized fashion, so that information can bet efficiently manipulated. In our case, we need the ability to any and all information that a user may need to recall. We have two general options:

1. Relational databases that are highly structured, referred to as "SQL" databases.
2. Non-Relational databases that are inherently "unstructured", referred to as "Non-SQL" databases.

There are many pros and cons to using SQL and Non-SQL databases. However in our case, since we will attempt to maximize efficiency while storing small sized documents, we will use Non-SQL. In particular, we will use a non-SQL database known as *MongoDb*, which is the most efficient database to use with a Node back end. Node js has a library called "mongoose" that allows a Node developer to efficiently create database schemes, query, insert, and interact with a MongoDb database efficiently from Node. Mongoose will be essential in constructing database related functionality.

2.3 User Creation, Authentication, and Maintenance

The next important methodology to cover is that of user authentication. Any web application that provides unique experiences depending on the specific user that is logged in will most likely require user authentication. In our motivational website, we want different users to have different activities to track. To achieve this goal we must provide a means of allowing a user to have unique credentials to login with. There are two different approaches we can take to achieve this goal:

1. Allow users to authenticate with an already existing Google, facebook, twitter, or LinkedIn account.
2. Allow users to authenticate with an email and password combination unique to our web application.

In the modern day option 1 is ideal for any small scale web app, so we will use option 1. Particularly, since most students have a school email account we will set up authentication using Google. To achieve this we will need to use a library called *passport* and a library called *passport-google-oauth20*. Passport is responsible for providing our Node application with the tools it needs to import login information form outside resources such as Google, Facebook, etc...
Passport-google-oauth20 is the specific instance of user registration type we will make use of as it allows users to authenticate with their google account.

2.4 Creating and Tracking Activities

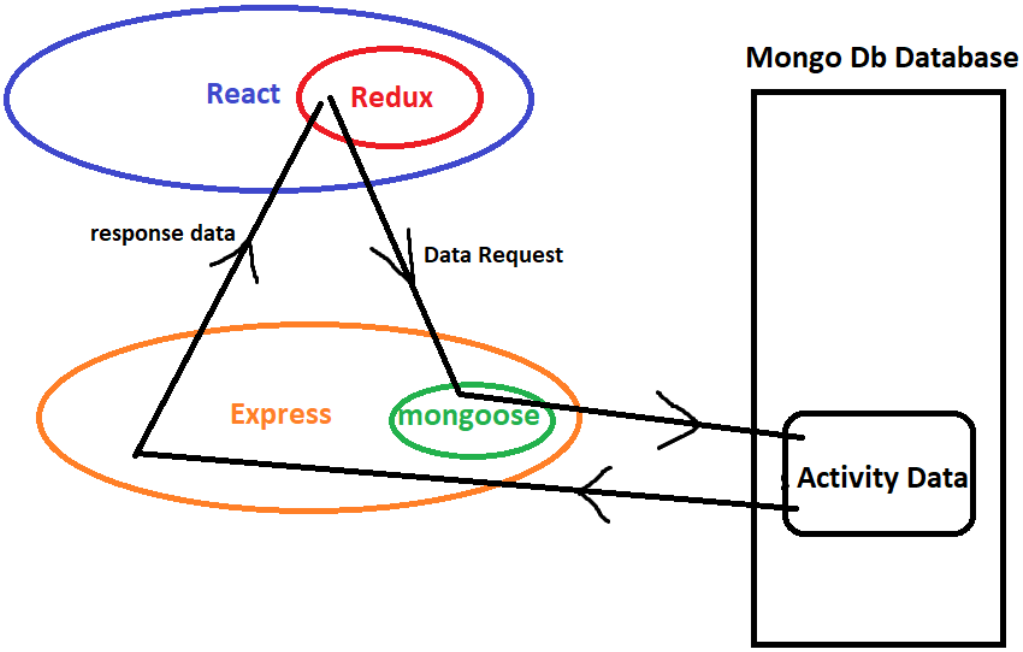
Thus far we've discussed how we will store user information and how we will authenticate users. Now we move to the important topic of allowing users to create different activities they can track. The word "activities" is used instead of "subjects" in order to be inclusive to all sorts of different tasks a student might want to track, such as exercise or cooking. But what is an activity exactly?

An activity is defined as something a user wants to motivate themselves to do. Any activity a user creates will contain a title, a subject, and a short description. For example, if a user wants to track "AP Biology", the user can create an activity will the same name and corresponding subject and description. Once an activity is created all users can select that activity to track. To accomplish this feature there will be an option for every user to filter between activities that have been created by all users, and activities that have been created by themselves. Lastly, these activities need to be tracked. To accomplish this we simply give the user an option to click on any created activity in order to be navigated to the "tracking page", where a user will be able to track both the "current" they've spent working, as well as their "global" work time. Now that the general overview of "Creating and Tracking Activities" is clear, we move next to a general tech overview.

Constructing the component thus far described in section 2.4 involves the following software technology.

- React - Constructs visual web page components. (Front End)
- Redux - Manages front end data. (Front End)
- Express - Responds to requests made from Redux and responds with the desired response. (Back End)
- Mongoose - Retrieves or inserts data to our MongoDb database from within Express. (Back End)

In more detail, React is used to create every single visual element visible to users. Of course many of these elements, such as the activities a user creates, need to be easily accessible to React so that React can dynamically display them. Redux is a data management tools that lives in the front end and is tightly connected to each React component. Redux will consistently update itself with relevant data by making requests to our Express back end. Express is simply a library we use in the back end to listen for incoming requests that Redux will make. Specifically, when express receives a request from Redux, Express then passes off instructions to mongoose in order to make the appropriate database request. Here is a visual representation of this interaction:



2.5 Tracking Online Presence

The next methodology to discuss involves that of Online Presence tracking. The purpose of this component is to give users a sense of community while working *without* causing excess distraction. The basic idea of this component is to allow users to see other users that are online and working on a similar activity. For instance, say a user is again studying AP Biology. This component will give the user an option to see everyone else currently studying AP biology at the same time.

There are two different technological approaches to construct a component that tracks user activity. The first methodology involves a JavaScript known as *socket.io*. Socket.io makes use of a very complex technology known as "web-sockets" that provide a stable connection between the user's browser and the back end server. If more real time components were to be apart of this project we would almost definitely make use of socket.io. However in our case socket.io adds unneeded complexity and may even slow down user experiences unnecessarily. Instead we will approach this component in a similar manner as we did section 2.4.

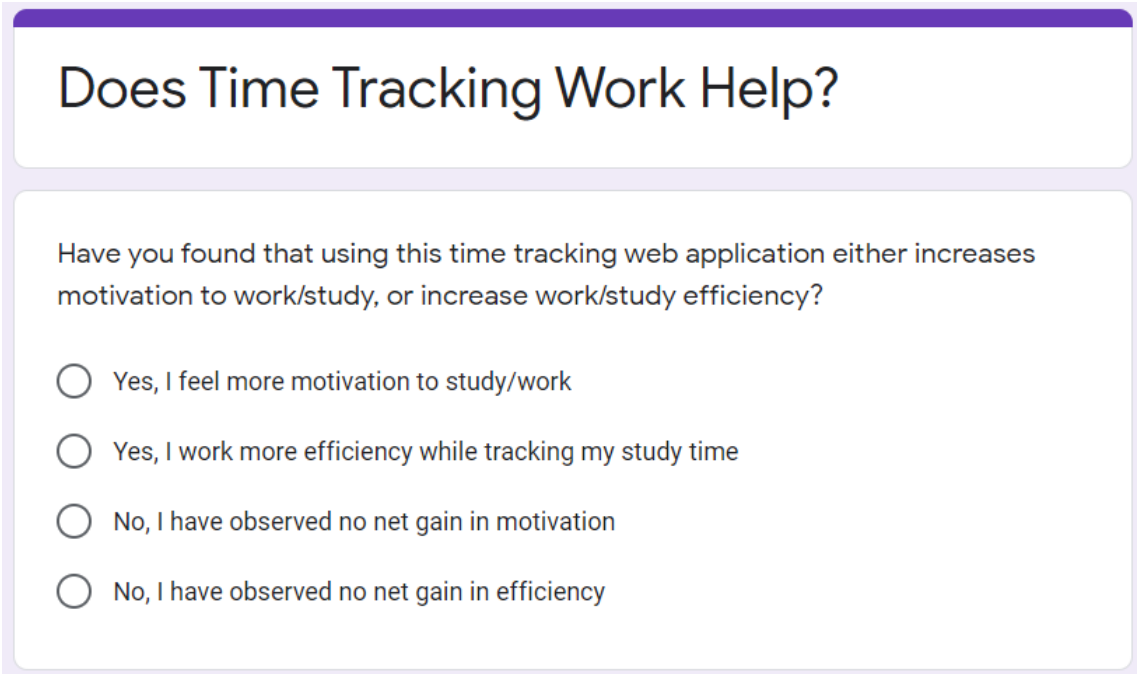
In order to keep track of each user that exists within our web application we store the user's email, Google Id, and Google Username. If we also keep track of the user's current URL and activity status we can determine what page of our web app they are on, as well as if they are still active. We can then use a built

in JavaScript function known as "setInterval", to update this information every couple seconds to keep the URL and activity status up to date in the MongoDb database. Lastly, we simply have to create a react component to always display a list of users that exist on any given page at any given time. All the technology needed to make this happen is the same as section 2.4; we only need React, Redux, Express, and Mongoose. Thus, there is nothing drastically different about this component in terms of technology, as long as we steer clear of socket.io.

2.6 User Feedback

2.6.1 Surveys

To determine if a motivational tool is actually motivational, surveys have to be given to users to determine if using the application is helpful in anyway. Helpful, in this case, means that a direct result of using a time tracking web application is more motivation to work and/or greater work efficiency. Clearly, it is trivial for a user to respond with whether or not a web app is useful. As the following diagram showcases, it is as simple as checking the yes box or no box.



2.6.2 User Analytics

The next method that will be used to determine the usefulness of a motivational time tracker is anonymous user data. Specifically, this involves analysing user statistics relating to how much time is spent tracking activities on a daily and weekly basis. For example, if there are 1,000 unique user accounts and only 100 of the 1,000 total users are activate on a weekly basis, we as developers can

assume one of two possible things. First, we can assume that the website's UI has underlying functionality that is flawed in someway. Second, we can assume that the core mechanics, and features of the website are not useful to 90% of the users that visit the website.

User Analytics has one major advantage and one major flaw when compared to user surveys. The advantage of user analytics lays in the fact that user's do not need to submit a survey. By simply using the web app a user will contribute to the on going development and betterment of time tracking motivation. However the big advantage user surveys have is that they allow users to better express themselves. This is because surveys give users the chance to specifically point out pros and cons of UI or functional components.

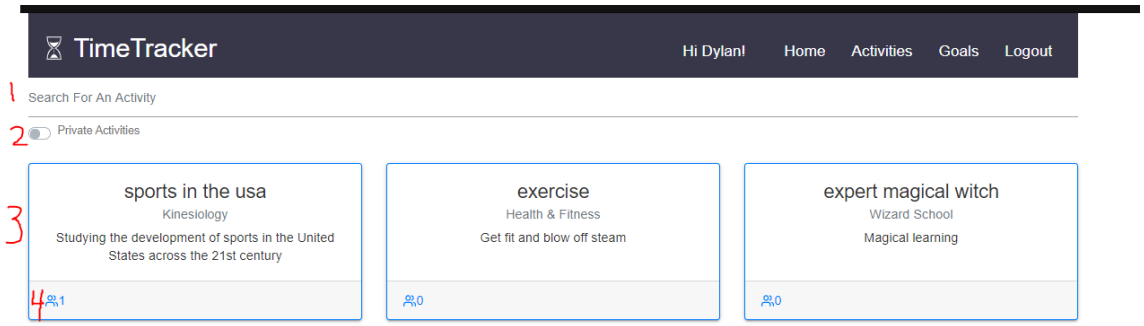
3 Results

Before we introduce the results of the motivational time tracker introduced in this paper let us briefly revisit the original goals of this project. We set out to build "a progress tracker that increases motivational to work and/or study". The proposed progress tracker is a modern day web application hosted on the internet for free. To view the finished results click here.

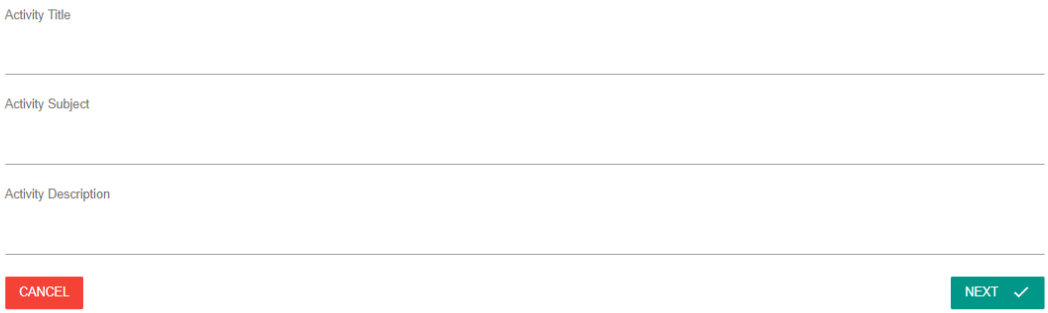
3.1 Activities

Recall that in the methods section we sought to build a page that allows users to create and track different activities. Note that if you wish to interact with the finished "activities" page, click here. There are three major components of the activities page:

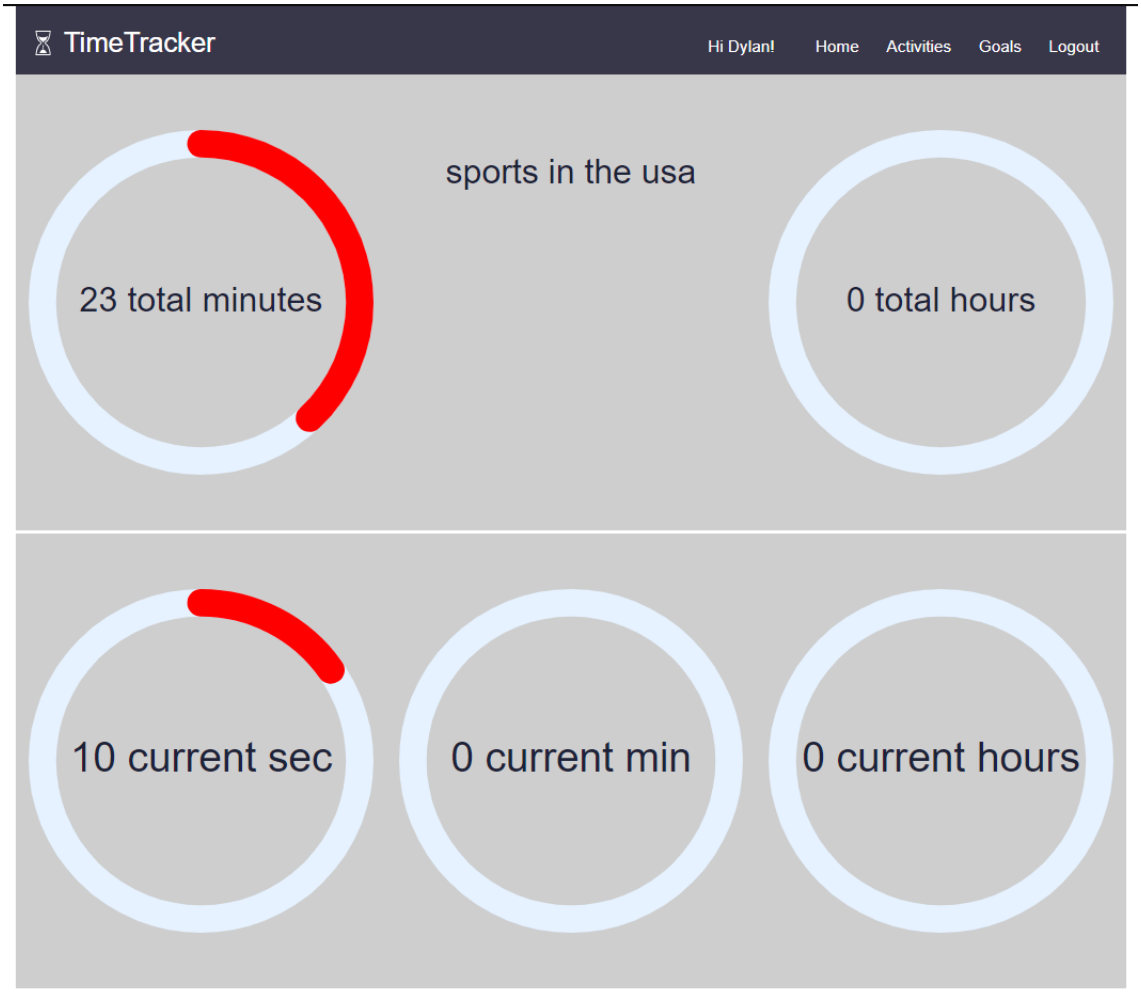
Activity Listing: where users can observe all available activities and choose one to track. The box to the right of the red "3" containing the title "sports in the usa" is a sample activity that a user can create. The little number to the right of the red "4" contains a counter for the number of users who are currently tracking the activity. The text input to the right of the red "1" allows users to dynamically search for activities. Lastly, the little toggle switch to the right of the red "2" allows users to toggle between public activities that all users have made and private activities that belong to themselves.



Activity Creation: where users can create activities to track. Activity Creation is very self explanatory. Users simply choose a title, description, and subject to go along with their activity. Once the user has verified their form inputs and clicked "submit", the activity will be created and will show up in activity listing.

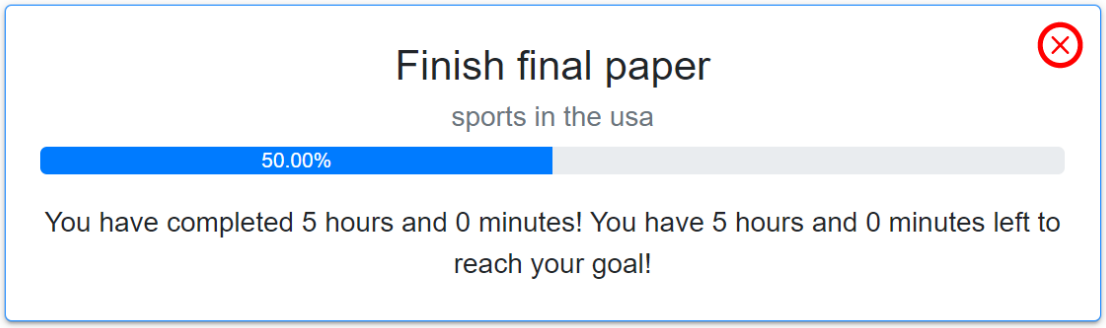


Activity Tracking: where users track activities. The activity tracking page is where users will be while working. To facilitate ease of use this page is designed similar to that of a car's speedometer. If a driver wants to check how fast the car is traveling they will quickly look at its speedometer. Clearly a car's speedometer should be designed to give the driver all the information they need as quickly as possible *without* distractions. The activity tracking page is designed to accomplish the same goal of simplicity. As can be observed below, it even resembles a speedometer in design. The activity tracking page keeps track of how long an activity has been worked on since its creation, and how long it has been tracked in the current study session.



3.2 Goals

To give users extra incentive to track activities a goal page has been implemented. The goal page gives users extra incentive to track activities by allowing them to create up to 1 goal per activity. Goals are constructed dynamically in that users do not have to manually update goals in any way. All users have to do is complete activity time by using the web application's built in time tracker. Goals will automatically update and display how much time a user has completed, as well as how much time is left to complete. The image below is an example of a 10 hour goal.



3.3 Online Presence

The next and final feature is *online presence*. Online presence displays users that are online on specific pages to simulate the feeling of studying in person. Similar to online features of facebook or linkedin, online presence allows people to see other users who are online at the same time. Online presence is dynamic in that the list of users change in real time depending on what users are currently active. Below are three different examples of what the user presence side bar displays. On the far left the user ”Dylan” is the only user currently viewing a Profile. In the middle ”Dylan” is the only user currently tracking ”sports in the USA”. And finally on the right there are three different users on the ”activities” page.

3.4 Analysing User Surveys

In section 2 we introduced how to determine whether or not a time tracking motivational app will give students more motivation to work. In this section we will concretely examine user feedback available thus far. Of the user survey’s sent out and received, one reports that using the web application leads to no net gain in efficiency but a net gain in motivation. Two others have stated the web application does not increase or decrease motivation.

These initial results reveal that tracking time doesn’t lead to an increase in work efficiency but does lead to an increase in motivation in some cases. Furthermore,

the response which holds there is an increase in motivation stated that the most relevant component is that of goal setting. The user went on to describe that they could more easily focus on working when they thought less about the work and more about time management. Thus, being able to set a particular time goal give them the ability to feel a greater sense of time awareness. In other words, they describe that it was easier to meet work goals when they were upfront about the amount of time they were willing to spend working.

In the two cases where no net gain in productivity were reported, the only feedback given was that the website didn't offer enough of a motivational advantage to take the extra time to use it's features. Database data showed that these users did not get around to exploring the goal creation features of the website, so these responses reveal that the goal setting UI is either hard to use, or disconnected from the time tracking portions of the web application.

3.5 Analysing User Analytics

Thus far there have been nine different unique active users. Each user has two different database attributes that help determine if these nine users are finding time tracking helpful. The first feature is a continuation of the front-end time time tracking features, except it has been implemented to do two important things:

1. Keep track of weekly active time; How much time a given user spends on the website per week.
2. A weekly activity time average.

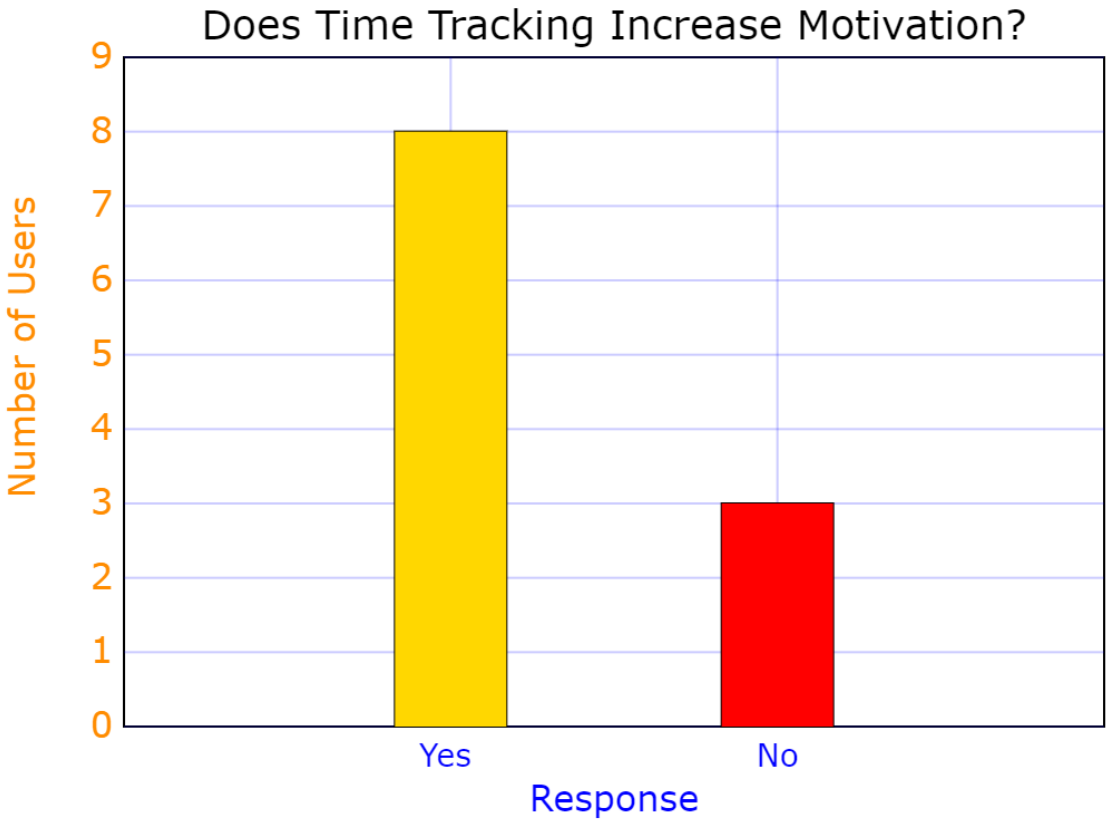
As developers we can use this information in a variety of different ways to analyze user activity. First and foremost, each of the nine users display declining weekly activity time and a shrinking activity averages. While this may seem problematic, there are simply not enough users to make a concrete assessment of our web application based on this information. Of course, it is necessary to acknowledge the clear decline in user activity. As developers we would hope that users find our software useful, and the fact that weekly activity has a clear decline is problematic. However in the long term extra time and users will tell if this statistic has concrete validity.

4 Discussion

4.1 Does Time Tracking Increase Study Motivation?

This section will concretely reveal if time tracking, as introduced in this paper, is successful in creating work motivation for students while working during social

distancing. So far it seems time tracking, when coupled with social features, lead to more work motivation but less work efficiency. This statement is based on a combination of provided user surveys and user analytics. On one hand user surveys reveal that setting time goals allows students to better identify the time they are willing to commit to working. Additionally, being able to see other users working on the same activity has allowed users to feel less isolation when working remotely. On the other hand, user's reveal that the simplicity of the web application reduces the time it takes to make use of the software and get to work. Even so, most users describe that the website doesn't actually increase work efficiency. Of course as developers we did not intend to increase work efficiency, but rather we set out to increase *motivation*. Below is a visual representation of the user responses.



4.2 Conclusion

There are two important changes that could be made to improve the user experience. The first change is simply redesigning the entire web app. The goal thus far has been to construct complex software that works well, instead of making a professional looking web application. As such, a complete design overhaul could increase the products usability. The second big change involves the addition of a social feed similar to that of LinkedIn or Facebook. This would increase the number of social components that lead to additional motivation to track study time. Just as a user on LinkedIn can share their work anniversaries, a

user on TimeTracker.com could share their work accomplishments to other users. Of course, implementing this feature would require many other features to work properly, such as the ability to add friends. In conclusion there are many things TimeTracker.com does well, such as providing users will an easy to use UI that wastes little of the user's time. However there also many features that could be added, such as better UI/UX, more advanced social features, and more study gamification.

5 Citation

1. Ford: Motivating Humans[1]

Ford's motivating humans is concerned about the study of how best to understand and solve motivation problems that lead to a decrease in productivity in all walks of life, ranging from school, to professional careers, to social actions. The purpose of this scholarly book is not to study all current scientific theories and human motivation, but rather is to explain how humans motivate themselves to be successful in general. In short, the author states that human motivation consists of the ability of a person to "direct, energize and regulate" (3) the activities which are necessary in order to find success of some sort. The theory describing this is denoted Motivational Systems Theory.

2 Social Networks to Motivate Humans[2]

One of the most prominent methods of creating motivation for an individual to consistently stay on track towards some goal is to implement a reward system. For difficult activities that require either long term dedication or short term dedication, having rewards to work towards helps to take focus away from the mundane and difficult tasks. It is still very much the case that the type and amount of rewards differ drastically among different people, and among different species. For instance, different dogs respond to different rewards differently - such as treats, verbal rewards, or petting. Humans on the other hand respond to rewards in a much more complicated and less scientifically understood way. Methods of giving rewards based off of social feedback is tested among study volunteers, and it is found that social feedback from social networks, such as positive feedback from friends online, increases motivation to spend more time working.

3. App Design and Learning Pathways[3]

[1] "Motivating Humans: Goals, Emotions, and Personal Agency Beliefs - Martin E. Ford - Google Books."

[2] "Leveraging Social Networks to Motivate Humans to Train Agents."

[3] "Young Students Using IPads: App Design and Content Influences on Their Learning Pathways - ScienceDirect."

In the last decade there has been the largest increase in available tools to use for the purposes of learning and motivation. Examples of such appliances include tablets such as the Google Pixel Slate or Apple's iPad. The question is, do the new technologies of the modern day actually promote motivation to learn? In many cases the introduction of modern technology into schools doesn't seem to provide the desired effect on education that is generally advertised. Understanding the intricacies and relationship between learning and technology starts with studying both student and adult interaction with tablets and other cool tech. The main research component that is studied is the user interface system which does the best job in facilitating problem-solving components of learning. In other words, the best design features of applications that result in high motivation to learn is what is sought after. Things like text-to-speech, highly interactive applications, and a mix of entertainment to keep learning fresh and interesting.

4. Learning potential in youth's online networks[4]

With the prevalence of the internet in the lives of young students, networked methods of learning are more available than ever before in history. Websites such as Khan Academy, Udemy, and coursera are examples of websites that give people access to learning anywhere there is a stable internet connection. A study done in the Netherlands show that learning online is found to be beneficial to students between the ages of 12 and 18, especially when students were given easy access to online tutoring and assistance.

5. Augmented Reality in Mathematics[5]

It is widely known that having visual representations of topics being learned in a classroom is extremely beneficial to the learning process. 3D real life objects as well as virtual objects (from a projector or computer screen) are both common. However with the introduction of virtual reality headsets, it is now possible to model essentially any 3D object in augmented reality for the purposes of aiding learning in classrooms. To research the relationship between virtual reality and learning, the physical, cognitive, and contextual components of virtual reality are studied and modeled. It is found that the ability to hold, touch, interact, and manipulate an object gives a student more motivation and context to learn about whatever subject the object pertains to. Additionally, the sheer abundance of virtual reality content that has been and can be created allows for students to have fun, meaningful experiences that lead to more fun while learning and consequently more information being retained. Furthermore, as virtuality reality technology progresses, more possibilities arise for people to have multi person experiences in virtual reality, fostering bonds and relationships over students in different environments.

[4] "Learning Potential in Youth's Online Networks: A Multilevel Approach - ScienceDirect."

[5] "A Psychological Perspective on Augmented Reality in the Mathematics Classroom - ScienceDirect."

6. Motivation and User Engagement in Fitness Tracking[6]

In recent years companies like fitbit have been coming out with wearable fitness trackers to encourage and motivated people to be active. Fitness trackers give people a sense of accomplishment by displaying the results of their activity in various different ways. The reason such devices are so successful is because it can be hard to see results from exercise in a short period of time (such as days, weeks, or even a month). With the aid of a fitness tracking device, people can closely monitor their progress and know that they are on the right track towards their goals. With fitness devices being in relatively high demand, the importance of proper design to enhance user experience is of the highest importance. Good design principles lead to better user experience, meaning the user understands the information presented on the fitness device and can consequently be motivated by such information to keep exercising. The result of a study done on a number of fitness volunteers shows that users were most motivated by motivation feedback. For devices worn on the wrist, for instance, motivational messages such as "You reached 10,000 steps for the day, way to go!" have thus far shown to be the most influential aspect of fitness devices leading to increased motivated to exercise.

7. Protection motivation theory[7]

There are many theories surrounding the complex processes of motivation. Protection motivation theory is one such theory, and in this research paper a study is done regarding how certain health information can create or increase motivation for someone to make lifestyle changes, according to protection motivation theory. In short, the paper defines protection motivation theory as a theory to further understand and simplify the process of finding motivation to do something. A major theme supported by research is that an individual's belief in their own abilities is one of the largest contributors in creating motivation.

8. An Introduction to Motivation[8]

A general overview of different motivational systems in humans. Various theories examined regarding what habitual values increase/interact with human motivation.

9. Work and motivation.[9] A psychological background of the relationship between motivation and work ethics.

10. An Exploratory Analysis of Textbook Usage and Study Habits: Misperceptions

[6] "Informatics — Free Full-Text — Motivation and User Engagement in Fitness Tracking: Heuristics for Mobile Healthcare Wearables"

[7] "Rogers, Ronald W., and Steven Prentice-Dunn. "Protection Motivation Theory." In Handbook of Health Behavior Research 1: Personal and Social Determinants, 113–32. New York, NY, US: Plenum Press, 1997."

[8] "Atkinson, J.W. (1964). An introduction to motivation. Van Nostrand. "

[9] "Vroom, V.H. (1964). Work and motivation. Wiley. . "

and Barriers to Success.[10] A psychological background of the relationship between motivation and work ethics.

[10] "Asimakopoulos, S.; Asimakopoulos, G.; Spillers, F. Motivation and User Engagement in Fitness Tracking: Heuristics for Mobile Healthcare Wearables. Informatics 2017, 4, 5."