

NAPP v2.0: Integration of freshmen students in Instituto Superior Técnico Campus Taguspark

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Abstract

The Mentoring Programme at Instituto Superior Técnico was created in 1996, and has underwent several changes since then. At Taguspark campus, in the academic year 2011/2012, there was a renewal with the integration of the monitoring of the results of the first exams, of the freshmen students, which resulted in a positive impact on them. One of the factors that need to be optimized was the part of the communication between Mentees, Mentors and Coordinator. So, for this purpose, a mobile application called NAPP was created in 2017. The features developed in the first version of the NAPP mobile application had aspects to improve, namely in user satisfaction. That said, with the improvement of the NAPP mobile application, the creation of new features and improving existing ones will be addressed, so that the communication of information is as efficient as possible, achieving an improved version.

Keywords: University Group Mentoring, Students' Academic Success, Mobile Application, Student Support

1. Introduction

The Student Support (AE) presently belongs to Taguspark Academic and Human Resources (AGRHT) on Taguspark campus. AE mission is essentially based on promoting the integration, accompaniment, and academic success of freshmen students on campus, through the Mentoring Programme. The Mentoring Programme was first applied in 1996 on Alameda campus, starting in 2011 on Taguspark campus, and underwent several modifications ever since. Currently its mission involves many actions such as: improvement of the relationship between the school and its students; development of all kind of initiatives that contribute to better student integration; strengthening the support for student initiatives, thus translating effective support from the school; promote academic success and development of welcoming actions for all students, with special focus on 1st year students and mobility students.¹

AE main project is the Mentoring Programme. The Mentoring Programme is focused on welcoming, integrating and assisting the freshmen students and international mobility students. This personalized service is provided by AE Coordinator and mainly by volunteer mentors. Mentors are students

from different courses and from advanced years with more experience and knowledge of how the Instituto Superior Técnico works. This support does not last only the first day of students' enrolment, but mentors will provide assistance throughout the whole year to mentees.

The Mentoring Programme in Taguspark (MP-TP) *campus* changed some strategies began from 2011 and now offers some differences from the one in Alameda *campus*. The most relevant difference in MP-TP is that the students are closely followed by the AE coordinator, to promote academic success, by keep a track of students first tests or exams notes. Yet, the involvement between mentors and mentees is such that mentors feel responsible for the success of their mentees. This impact differentiates in a positive way, strengthening the importance of a continuous follow up by all people and entities involved.

MP-TP depends on communication, which is the most important aspect to this Mentoring Programme. To succeed their goals, the three parties involved (AE coordinator, mentors and mentees) need to collaborate, strongly among them, to achieve these goals and all the parties benefit as well.

Among the three parties, mentees have to be active in communicating primarily with their mentor.

¹<https://agrhat.tecnico.ulisboa.pt/en/apoio-ao-estudante/>

The communication that they need to have is on reporting their marks. Monitoring mentees' marks will help mentors and mostly the coordinator, to understand the performance of mentees during the semester.

AE coordinator is responsible to closely follow and analyze mentees' marks along the semester with the help of a Dashboard, that was developed previously by Catarina Cepeda [3]. This Dashboard is integrated with NAPP mobile application developed by Pedro Veiga [12]. The coordinator is able to fast analyze which are the mentees that are at risk of failing the current semester.

When it happens, the coordinator decides the best approach to help the mentee, which can include some specific help from the corresponding mentor, or a personalized interview to understand the possible causes of the failure.

In the academic year of 2018/2019 a grading report made possible by NAPP Dashboard, and a first attempt to use NAPP Dashboard and make the most of it. A part of the main goal, reporting marks, was then achieved, but not totally. The first version of NAPP core feature was functional but the implemented solution was not the desired one.

The NAPP v1.0 mobile application does not offer the desired functionality to both mentors and mentees so that they can use it more often. The goal is to integrate freshmen students and enhance their academic success. Features as visualize their own progress throughout the semester, through progressive graphs, makes it easier to analyze what can be improved in the next assessments. In integrating freshmen students, the events that take place at IST are an asset to students acquire other knowledge other than in the classroom context. This feature and reporting marks, enhanced with a notification service, will streamline the use of the mobile application.

1.1. Key contributions

Multiple enhancements were made to NAPP v1.0 mobile application. The design was totally rebuilt with the main objective of providing a better user experience. The new implemented features in NAPP v2.0 were the following:

- Graphs - Mentees and mentors can follow their progress throughout the semester in each curricular unit.
- Notifications - Users become aware of important actions that take place in the mobile application.
- Feedback - Mentors can give their input to evaluate their mentees. Thus, they have quick feedback from their mentor, who is responsible for

helping their mentees to integrate into the university environment and try to enhance their academic success.

- Filters - Those can be applied to filter their activity center, where it shows every action that happened on NAPP.
- Events - Every NAPP user can be aware of IST related events, allowing to integrate and engaging freshmen students to participate in them.

The NAPP v2.0 mobile application underwent a usability test and also was performed a two week beta tests with users. This test allowed to recognize some bugs that were found by the users.

1.2. Document Outline

This document structure will be the following: chapter 2 introduces the related work, that includes a study that evaluates the importance of mentoring programmes. Also, it includes three mentoring software solutions, in particular one is focused on a mobile application. It also introduces NAPP v1.0 framework, and an analysis of the used technologies. Chapter 3 explains all the work that was done to improve NAPP and Chapter 4 presents the various phases of evaluation. Lastly, Chapter 5 presents the conclusions of this work and outlines future work.

2. Background

Corporations and organizations can face unique challenges when it comes to developing or using a mentoring software to help the participants having a better experience in the context they are in. These mentoring software solutions are increasingly used around the world. The focus of these systems mostly emphasizes communication among mentees, mentors and yet provides data to programme coordinators for them to assess the progress and have results about the planned programme.

There are plenty of software systems for mentoring. But most of them are focused on corporations. Mentoring programmes, at universities, that involve technology built and shared among parties is not as common as it could be expected. The importance of combining these software solutions with programme goals, is a good omen that the programmes goals results will be achieved.

In the following subsections is presented a review of a comprehensive study made in the United Kingdom about the different type of mentoring programmes, and a summary on software solutions that support mentoring programmes, which include NAPP v1.0.

2.1. Peer Mentoring Programmes

Each institution can have a different definition of mentoring [4] and the used approaches into these

mentoring programmes aim to strengthen student engagement and relationship building to improve the academic performance [9, 8]. In this section, is described a comprehensive study about the differences of some mentoring programmes in the United Kingdom.

2.1.1 Aston University study

A study about student retention was published in November 2011 by Aston University[1]. This study was initiated by Paul Hamlyn Foundation and the Higher Education Funding Council for England. The seven projects in the programme, involving twenty two Higher Education Institutions, have been evaluated based on effective strategies to help students to succeed in universities. This study makes clear that peer mentoring programmes needs to be well thought and can work with a modest investment, while the benefits in terms of students' academic success at transition can be considerable.

Pastoral Peer Mentoring The transition period between High School to university is widely acknowledged as being crucial to students' academic success [5, 11]. By looking at what students concerns are, this study shows that social aspects of university life that concern students the most. Despite such worries before starting this new stage, most of students feel confident and committed to succeed academically. Also, this short-term or long-term transitional peer mentoring quickly helps students feel integrated into university environment and works better when the mentors and mentees build a relationship that does not end in a few weeks but instead continues in the first university year.

To support the previous statement, results of the surveys made in the transition period say that around 70% of 374 surveyed students concerns about making friends, agreed that peer mentoring helped them to feel part of university and are confident to succeed academically.

Writing Peer Mentoring In this strand of mentoring the mentors, that are students of the corresponding institutions, are hired to provide their help during six to eight hours per week. These mentors are carefully selected, trained and managed by a staff member. This strand of mentoring is more formal and focused on a one-to-one relation.

The focus is providing support in all aspects of writing (sentence structure, punctuation, use of paragraphs and organize writing for studying)[6, 10] providing a environment in which students find someone who can validate their writing. Moreover, this mentor is focused only on one student at time, as opposed to Pastoral Mentoring where mentors have to focus in a group of mentees.

As the result of the interviews and surveys that were made to students, an ideal Peer Mentoring Approach was developed called Transition+.

Transition+ main features are the following: freshmen students deliberately can leave the Programme; early matching between mentors and mentees; groups of three to five mentees; mentees are asked if they have any preference for their mentor; initially the focus is helping students settling in university and then to help mentees with academic issues.

The pairing method that is in use at Taguspark *campus* can be improved with some interesting ideas. Aspects such as geographic area or interests can be used to link mentors and mentees and help to create a faster, stronger and direct connection instantly. At the end, what all Peer-Mentoring programmes want is to connect people.

Writing Peer Mentoring is an interesting tool that could be tested on Instituto Superior Técnico because many students fail to clarify and structure their thinking when writing it down. Consequently those ideas that are not so well structured and described can be a cause of lower marks in projects and laboratories.

2.2. NAPP v1.0

2.2.1 Architecture of NAPP v1.0 framework

The architecture of the NAPP framework consists of two applications: NAPP mobile application and a Dashboard web application. Mobile application is used exclusively by mentors and mentees. Dashboard is exclusively used by AE coordinator.

In the mobile application, mentors and mentees can use multiple features (such as sending marks) that will be performed by REST API calls sending information into NAPP databases. This information is then possible to visualize in AE coordinator Dashboard. Dashboard offers the ability to:

- Visualize graphs with the respective marks of the different evaluations by discipline;
- Visualize graphs with total number of tasks performed by the mentor;
- Add the subjects of each semester with their respective assessments, allowing mentees to submit their marks.

2.2.2 NAPP mobile application

NAPP v1.0 mobile application was developed during the Master's degree thesis of Pedro Veiga, to try to tackle the communication problems of MP-TP.

In NAPP v1.0, mentors login through FenixEdu's Central Authentication Service.²

²<https://fenixedu.org/>

After that, mentors had a feature that enabled them to create tasks for their whole mentee group or send a task to a particular mentee where he could point out when this task was done. This functionality was created as a notification service to advise or warn mentees to send their marks as soon as possible. Since it is an extra step that should be avoided because it involves mentors in a process that could be handled, in a automatic and more efficient way, as a notification service. Yet, mentors in this first version do not have a mechanism to closely follow their mentees marks. This is not only an interesting feature for mentors but also essential for preventing and detecting errors when reporting marks to the NAPP system.

Mentees can report their marks whenever they are graded in each particular project, exam or other assessment moment (see Fig. 1).

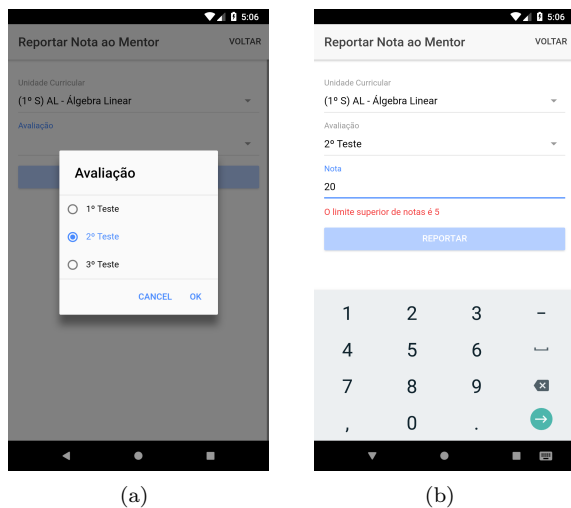


Figure 1: (a) Selection of mentee evaluation method and reporting grade (b).

AE coordinator shall schedule in the system when these assessments occur and the mentees reported marks after they are available can be graphically visualized in the Dashboard.

2.3. Existing Mentoring Softwares

Xinspire, Chronus and Tyfy are software solutions that can be applied to mentoring programmes within universities. Tyfy has a direct focus on mobile aspects. For this reason, it will be analyzed with more detail. The main features that Tyfy offers are:

- Visualize reported issues when mentees ask questions to mentors;
- Have access to create and delete forum topics where students can ask their questions;
- Feedback that mentees gave to mentors;

- Inform students of events happening at the university.

The focus of the Tyfy application is quite different from the focus of the NAPP v2.0 mobile application. The core of Tyfy is to ensure that freshmen students, who are enrolled in the application, are able to clear questions, as soon as possible, with students who have already had these courses in previous years. With this, students see their questions clarified but much maintenance and moderation is required because without moderation there will be a problem of validation and mentors are not supposed to tutor mentees but to guide their studies. Also, STEM (Science, Technology, Engineering, Mathematics) approach and the office hours provided by teachers are always strongly advised to be attended. The purpose of MP-TP and NAPP is not the same. The main objective, with NAPP v2.0, is for mentors to feel engaged and to be able to motivate their mentees to achieve better school results.

Mentors at NAPP aim to accompany and integrate their mentees throughout the school year, being responsible for a group of mentors who are assigned before the first semester begins. For better follow-up and to be able to help their mentees, mentors can access the assessments that their mentees had (when they send the respective evaluation) giving quick feedback about it. At Tyfy, as the answer to a question posed by mentees is the most important, the feedback is given in reverse, that is, the mentee evaluates the mentor if the mentor was able to help with the question in question. One of the objectives of the MP-TP is to integrate students in the academic environment and that they can make the transition smoothly. The feedback in NAPP aims to make the mentees feel that their mentors keep up with them and that they motivate them in some way.

An idea taken from Tyfy was the creation of events. This feature can have a very strong impact on new students because many of them want to participate in other activities created by the university to feel that they are integrating and that they are absorbing more knowledge through other sources and not just through lectures. Thus, students have one more tool where this kind of information is available since Taguspark *campus* is a small one and information is scattered in many formats from flyers and posters, that are distributed in every amphitheater, to digital platforms like Facebook or Instagram.

2.4. Analysis of NAPP v1.0 Technologies

NAPP mobile application was built using Ionic Framework, which is a framework that provides tools to develop Cross-Platform Applications using Web technologies like CSS, HTML5 and JavaScript.

Comparing with the development of native mobile applications, the big advantage here is that the developer requires a lower development time.

Despite of a single codebase for all platforms, the application has to be distributed through native Application Stores, such as iOS App Store and Google Play.

The current NAPP framework architecture (see Fig. 2) is explained below.

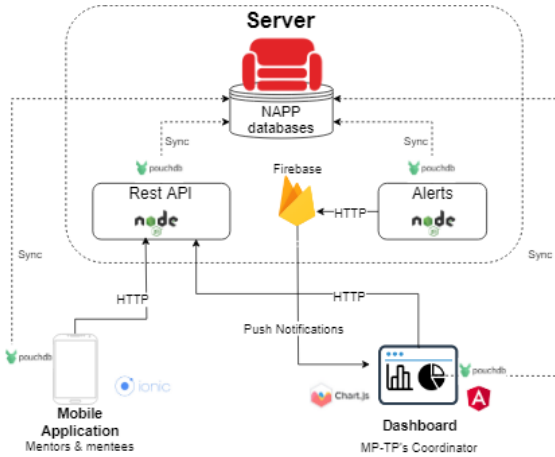


Figure 2: Current NAPP framework architecture

The server-side was using Apache CouchDB³ database. CouchDB is an open-source, document-oriented NoSQL database. CouchDB database, which was running, on the server stores all the data related with the NAPP v1.0 framework (Dashboard and Mobile Application). PouchDB⁴ was used to managed the local data storage on the Dashboard and the mobile application. PouchDB is an open-source JavaScript database. It was created to help developers build applications that work as well offline as they do online. PouchDB stores data on the device, and then syncs those data to the server-side CouchDB database when an Internet connection is available. For this automatic and reliable sync, Couch Replication Protocol is used. Used technologies in the NAPP v1.0 framework are not the most appropriate and have some issues that are going to be explained in Section 3.

3. Approach

The first objective of this thesis, after analyzing NAPP v1.0 mobile application technologies in Section 2.4, was to make a new design for the mobile application that was more appealing, with better performance and user-friendly so that the application becomes more pleasant and generates more engagement among mentors and mentees.

³<https://couchdb.apache.org/>

⁴<https://pouchdb.com>

Ionic Framework uses web technology to deliver a native-like experience. This web technologies are wrapped by Apache Cordova⁵ which is an open source framework that takes the application and renders it in a WebView⁶. WebView's time render scale according to the number of graphics components in that same container, thus causing a potential performance degradation [7]. Another downside is the absence of Hot-Reloading⁷. For the developer, whenever changes are made, the whole app has to be refreshed, causing a slower development process.

To improve pointed Ionic Framework issues, React Native is the solution. React Native is an open-source mobile application framework created by Facebook. The big advantage, unlike the Ionic Framework, is that it has a Javascript thread that interprets the JS written code (React-Like) and publishes events to the Main Thread which refreshes the UI and calls native code thus increasing performance. Other advantages it offers are Hot Reloading and React-Native developer community is larger than Ionic Framework.

Using PouchDB integrated with CouchDB, as database technologies, instead of being a REST API developed specifically for NAPP v1.0, users of the mobile application (mentees and mentors) must have access to the remote database password. What happens, at this moment, is that users after being authenticated receive the password from the NAPP v1.0 database so that they can have access to it. Accessing this password is not a good practice as a malicious user may have access to the database and thus have access to all data from the NAPP database. Hereupon, using CouchDB as a database running on the server loses the viability of choosing it as a server database because it was chosen by the synchronization functionality between the different local databases.

MongoDB is an open source cross-platform database software that is written in C ++. This choice also comes to solve two important issues. The first issue is that the library developed for Node is quite simple and practical to make queries. The second issue is to correct a serious flaw that CouchDB does not offer, which are transactions. Transactions in databases allow correct recovery from failures and keep the database consistent in cases of system failure.

In Figure 3 it is possible to see a schematic of the system architecture. Users that use most features, will make calls to the REST API. If one of the four actions (Tasks, Events, Marks, Feedback)

⁵<https://apache.cordova.org/>

⁶WebView is an application component that is used to display web content within a native application

⁷Hot reloading allows the developer to apply changes without reloading the whole app

is performed, the Firebase Cloud Messaging service is called, thus sending notifications to the respective users. Users also have the option to use the mobile application in offline mode. Requests that are made in the application while the user has no network, are sent to a queue and are sent when the user reaches a stable network again. In the following sections, such as libraries, features, database and the most important REST API endpoints for the realization of this project are explained in more detail.

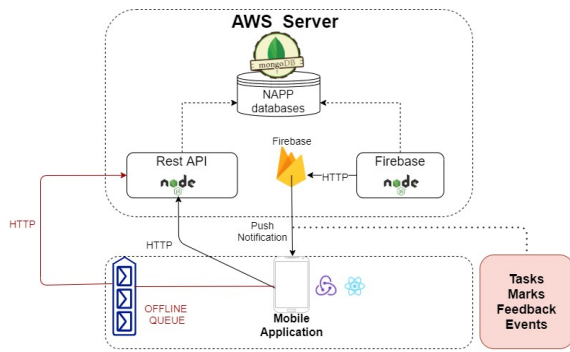


Figure 3: NAPP v2.0 architecture

3.1. Tasks feature

Tasks feature was created with a focus on mentees, since they are in a new environment where their study method has to be more rigorous. This feature helps mentees organize their study. Also, this feature allows mentors to be able to help mentees by creating tasks for them. In Figure 4 an example of a task creation by the mentors can be seen.

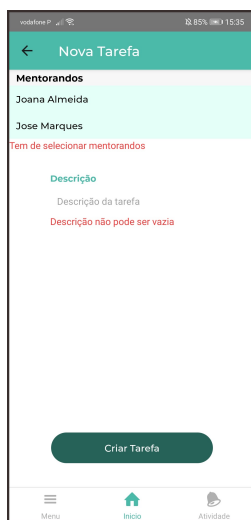


Figure 4: Task creation by mentor

The only rule to create a task is that it can not have an empty description field, otherwise an error will appear asking the mentor or mentee to fulfill

the empty space. In addition, the mentor will have to select the mentees who will receive the task that has been described. To create the task, users have to click on the "Criar tarefa" (Create task) button. Each task can be viewed in the "Atividade" (Activity) menu. By clicking on the "Ver mais" (Show more) button, four more information are available:

- Data (Date) - Describes when this task was created, allowing to check if it is a recent or old task.
- Aluno ISTID (Alumni ID) - Describes the istID of the task creator, allowing users to check if the mentee created the task or the corresponding mentor.
- Tipo (Type) - It has the default value "Por concluir". If it is completed, the value will be "Concluidas".
- Descrição (Description) - Describes information about the task to be performed.

Still in the "Ver mais" (Show more) menu of the respective task, the user can close the window by clicking on "Fechar" (Close) button or can complete the task by clicking on "Concluir" (Finish) button, if it is still "Por concluir" (Unfinished) state (see Fig 5). Finally, when the user completes a task, the "Menu de Estado" (State menu) changes the total number of tasks that have been completed.

3.2. Notifications feature

Of all the implemented features, the Notifications feature is the most important of all because it aims to alert mentors and mentees of status updates that happen in the entire NAPP v2.0 mobile application. With this, it was thought that notifications should be received by users reaching the conclusion that they should receive notifications from four different actions:

- Novo evento (New Event) - Users receive a notification whenever a new event is added to the Events Database.
- Nova tarefa (New Task) - When the mentor creates tasks for their mentees, they receive a notification to alert them that a new task has been assigned by their mentor.
- Feedback - The mentor always receives a notification when one of his/her mentees sends a new mark, with the aim of the mentor to provide feedback regarding this mark as soon as possible.
- Feedback realizado (Accomplished Feedback) - The mentee receives notification when one of their grades received feedback from their mentor.



Figure 5: Detailed information of a task

Also, when a task is completed by the mentor, the status update of that task is sent by notification to the respective mentor but without a message. This decision was made because the mentees can have several tasks and can complete all of them quickly, thus preventing their mentor from receiving multiple notifications of the various tasks completed, which would be quite elusive.

3.3. Graphs feature

The graphs feature is available for both mentors and mentees. The creation of this feature comes with the need of the mentees to understand more clearly how their progress has been developing throughout the semester, in a given curricular unit. When viewing a graph it becomes much clearer and more noticeable how the evolution has been throughout the semester.

For users to access this feature, they have to click on the "Gráficos" (Graphs) button available in the "Home" menu or by clicking on the "Menu" menu in the "Visualizar Informação" (Visualize Information) section. The mentees, when clicking, a page will show to select the "Unidade Curricular" (Curricular Unit) that they want to visualize the respective graph. Mentors to view the graphs of the different curricular units, first have to select which mentee they want to check the evaluations and then the respective curricular unit. In Figure 6 can be seen the progression through the semester of a mentee in a specific course unit.

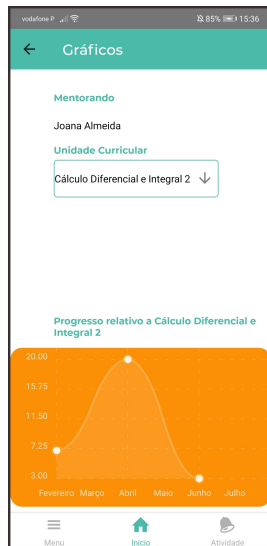


Figure 6: Graph showing Cálculo Diferencial e Integral 2 (Differential and integral calculus 2) marks of a mentee

3.4. Report grade feature

This feature allows mentees to report their evaluations to their respective mentor to be able to follow

the academic path of their mentees. With this, the mentors are able to be aware of a faster and instantaneous way of the course they are doing throughout the school year. Thus, when mentors are able to verify the score of their mentees' assessments, they can act by helping their mentees to obtain better marks in the next assessments or understand, with the mentee, the reason for the classification obtained.

To use this feature, the mentee has to click on the "Enviar Nota" (Send Mark) button, available in the "Home" bottom menu or in the "Menu" bottom menu in the "Estudo" (Study) section. The fields that the mentee must fill in to submit an assessment are in Figure 7. Below is an explanation of each field:

- Unidade Curricular (Curricular Unit) - Contains the name of the Course Unit of the respective assessment.
- Avaliação (Type of Evaluation) - Set of previously defined evaluations that correspond to the evaluation to be submitted. Contains the "Outro" (Other) option where the mentee will have to indicate what type of assessment corresponds.
- Data de avaliação (Assessment date) - The mentee clicking on the date will open the calendar corresponding to the operating system of their smartphone, and must select when the assessment occurred. This field is important for a correct functioning of the Graphs Feature 3.3
- Nota (Mark) - On a scale of a number between $[0,20]$, with a maximum of two decimal places, the student must insert the corresponding assessment grade.
- Outro (Other) - This field is dependent on the selection of "Avaliação" with the option "Outro". In this field, the mentee will have to indicate the type of assessment he intends to submit.
- Comentários (Commentaries) - In this field, the mentor can optionally make comments on the assessment mark in question.

3.5. Feedback feature

This feature was created for mentors, with the intention of being able to follow the progress of their mentees and to be able to give a quick feedback regarding the evaluations that they have throughout the school year. For mentors to provide feedback, mentees must report their assessment results



Figure 7: Screen of "Enviar Nota" (Send Mark)

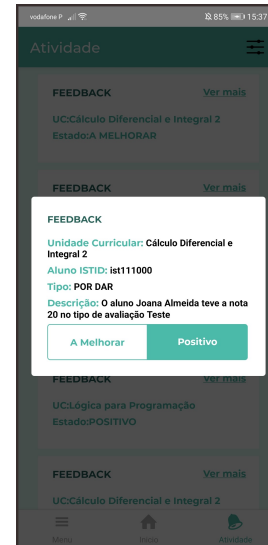


Figure 8: Information of a feedback

as mentioned in the subsection 3.4. After receiving the grades, it will be visible in the "Atividade" (Activity) menu where it can be viewed some information about the assessment. To use this feature, the mentor has to click on the "Ver mais" (Show more) button of the respective assessment where four more information fields are available. These fields are described below:

- Unidade Curricular (Curricular Unit) - Contains the name of the Course Unit of the respective assessment.
- Aluno ISTID (Alumni ID) - It contains the istID of the mentee who sent the grade, allowing to verify the istID of the respective mentor.
- Tipo (Type) - It has the default value "Por dar" (To provide), letting the mentor and mentee know that this evaluation does not have any kind of feedback. If the mentor clicks on the "Positivo" (Positive) button, the feedback is from that evaluation will have the value "Positivo" or if the "A melhorar" (To improve) button is clicked, the value will be "A melhorar" (To improve) (see Fig 8).
- Descrição (Description) - Describes the information about the evaluation sent by the mentee, indicating the name of the mentee, grade and under what evaluation.

3.6. REST API

Most of the features that users can perform in the NAPP v2.0 mobile application, involve some type of request that has to be sent to the server. For this purpose, a REST API was created to allow different interactions between the Frontend and the Backend.

The REST API serves several purposes. The first is to allow users to register and have their identities validated when they enter the application, making it impossible for users who are not allowed to use the application to access it (registration and subsequent login). Then, it has the function of sending data to the database, writing or changing values in it, such as creating tasks (part of writing) and giving feedback to a mentoring grades (changing values in the database). Also, when users log into the application, they must be able to access the respective data so that the application can provide its functionality without problems. Therefore, its function is to be able to retrieve information from users.

4. NAPP mobile application usability test

In order to be able to detect and correct flaws in its design, the NAPP v2.0 mobile application needed to undergo usability testing. The users were asked to perform a set of tasks using the application, where these tasks were representing realistic scenarios of usage. To perform the testing, mentors were contacted via email to participate in this usability test. This test occurred, on May 1st, via Zoom meeting, due to the pandemic situation, where all the students had to answer in private for each task they were performing because answers that could be sent in public could influence the other testers to change his answer for a task. Each task was shared one by one, via share screen option in Zoom. After every user answered for that particular task, the next task would take place.

Four mentors participated in the usability tests during which they had to install the Android Package that was created and sent by email to them. Also, multiple equal test accounts have been created for mentors to be able to perform usability

tests without any problems.

Overall, users were fairly successful in completing the tasks that were presented. However in the task that consisted to verify how many grades were sent by a specific user and course, only one mentor did it successfully. After the set of tasks was concluded, users answered to a SUS[2] survey, where an acceptable score ranges between 60 and 70, to get feedback on the usability of the system. The SUS survey score was 90.1, indicating that there is a high satisfaction level while users are using the mobile application.

4.1. NAPP mobile application beta tests

Great value comes from beta testing, since such tests can provide more objectivity and additional insights on NAPP v2.0 mobile application. The obtained feedback aim to identify and fix important issues, and suggest user’s experience improvements.

The API that was being used on localhost to test the application, had to be migrated to an Amazon AWS (Free Tier) server, where all the necessary components were installed to make it work, that is - MongoDB and Node.js. The beta tests were conducted only for Android because for iOS there were crucial features that were not fully functional. Thus beta testers with Android smartphones were included.

To beta test NAPP v2.0 mobile application, circa ten Mentors where contacted via email and four of them confirmed that they and their mentees could participate in the testing of the application. In total, fifteen users used NAPP v2.0 mobile application for two weeks in a row - three mentors who had three mentees and one other mentor had two mentees. The Android Package was created to install the application on different smartphones. After the Android Package was created, it was then emailed to the mentors and mentees that would participate in the beta tests.

A PDF was sent to the mentors and their mentees with a tutorial on how to install and each functionality they had at their disposal in the mobile application. During the two weeks of testing, which occurred from May 1st to May 14th can be seen in Figure 9, the distribution of the activity logs in each day. Also, by analyzing every action that was performed in Table 1, the most used functionality was the creation and completion of tasks where of the twenty five activity logs generated, twelve and six correspond respectively to the two functionalities. In the second week there was a greater use of the application by the users that tested the application.

After the beta testing phase ended, a second session, on May 22nd, was organized via Zoom where any of the participants could give feedback of their own experience. The feedback given revealed that

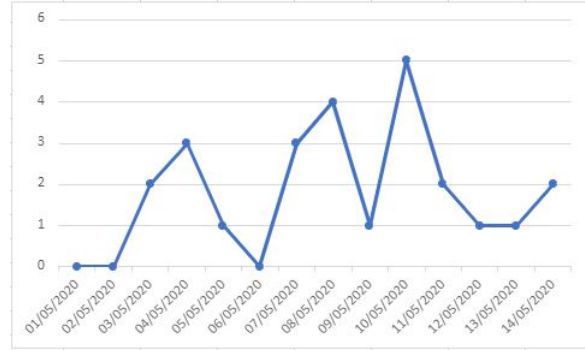


Figure 9: The activity logs generated in two weeks of NAPP mobile beta test

one feature that was missing was the possibility of mentors to create a task to be send simultaneously to several of their mentees and not just one. Also, it was reported by a mentee the report grade feature had a small issue. To send a mark, with a decimal part, the user had to use a comma instead of a dot and the numpad keyboard of some operating systems only shows the dot.

| Action Type | Occurrences |
|---------------|-------------|
| Create Task | 12 |
| Complete Task | 8 |
| New Grade | 3 |
| Feedback | 2 |
| TOTAL | 25 |

Table 1: Occurrences of each action in beta tests

5. Conclusions

The objective of this thesis was to achieve an updated mobile application for MP-TP. The features, that were mentioned in Section 1.1 and with the feedback given after the beta tests, were all successfully implemented. Users can follow their progress with graphs, notifications engages users to use NAPP, mentees can get quick feedback about an evaluation, the activity center can be properly filtered showing the actions accordingly with applied filters, as well as being able to be aware of IST related events through the event notifications.

The first objective was to check the design of NAPP v1.0 mobile application and it was concluded that it had an unappealing aspect for a mobile application because of a non native feeling that Ionic Framework offers to users. The design is very important in an application because it is the main property that will engage the users to use it, since it makes the usage of the features easier and intuitive. With this change for React Native, the users have a native-like user experience and have a better performance in their mobile phones since it does not use a WebView to render the components as Ionic

Framework does. It was very important to be able to reach a stage when the fewer possible clicks are required to make the application in a scalable way, so that more features could be implemented in the future. So this could be reached, the final design in Section 2.4 was implemented, fulfilling all the mentioned goals.

Changing database technologies solved an important security and data consistency issue. MongoDB offers the possibility to use transactions. With this, it can prevent system failures making all the documents in the database consistent. Also, users do not need the database password to use the offline mode on NAPP v2.0 mobile application. React Native has a offline queue library which saves HTTP requests in a queue. These are dispatched when users mobile network is available. In NAPP v1.0, with Ionic Framework and CouchDB, the user had in his mobile phone the database password, which could lead to potential security risks.

5.1. Future work

For a correct NAPP framework functioning, the first step should be focused on changing the NAPP v1.0 Dashboard API, meaning that API calls will be made to MongoDB instead of CouchDB. A portion of this change from CouchDB to MongoDB is already done. It should be followed by tests to detect any flaws in the endpoints.

After these changes, the next step has be focused on modifying some aspects in the NAPP v2.0 mobile application: the login method should be replaced by FenixEdu's Central Authentication Service because is this more convenient for students; develop an interface, in NAPP Dashboard, for the AE coordinator to be able to create events taking place on IST. At this point, NAPP framework should be proceeded with beta tests. Then, new features that the AE coordinator thinks necessary could be implemented.

To finalize, NAPP framework must be properly monitored by DSI personnel since mobile operating systems are constantly being updated leading to changes that can cause instability.

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