Supplementary Information for

# Integrated Instrumental Analysis Teaching Platform with Smartphone-Operated Fluorometer

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## PUSH NOTIFICATION SERVICE INSTALLATION GUIDE

## **1. GOOGLE FIREBASE CONFIGURATION**

1.1. GOOGLE FIREBASE CONSOLE

Go to Google Firebase console.

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Figure S1 : Access panel to google firebase and its console(A).

1.2. CREATE A PROJECT

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	+ Adicionar projeto	plataforma-de-ensino-químico	
	Explorar projeto de demonstração		

Figure S2: Firebase home page and button to create a new project(B).

1.3. API KEY (SERVER KEY) and GOOGLE PROJECT NUMBER (SENDER KEY)

1.3.1 Go to Project Overview (C) >CLOUD MASSAGING (D)

1.3.2. Copy the API KEY (E) and Google Project Number (F)

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**Figure S3**: Google firebase panel and its respective Cloud Messaging (D) section where the API KEY (E) and Google Project Number (F) are available.

#### 2. ONE SIGNAL PLATFORM CONFIGURATION

### 2.1 OneSignal platform

Access the OneSignal platform and click in GET STARTED(G) for mobile notifications.

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Figure S4: Home page of OneSignal platform and button to initialize the service (G).

### 2.2 CHOOSE THE PLATFORM

Select the Google Android (H) as platform and click in next button (I).

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2.2.1 Google Android (GCM) configuration

Paste the API KEY and Google Project Number from item 1.3.2 in their respective fields (J).

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Figure S6: Fields to insert the API KEY and Google Project Number.

## 2.2.2 Choosing the software development (SDK)

Select the Server API (K).

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#### 2.2.3. Server API Integration

The **APP ID** (L) must be saved because it is the key's identification of push notification system. This key must bey implemented on the app software.

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Figure S8: Server API integration and its App ID (L)

## 3. Configuration on the Android App

In the thunkable platform you must add the OneSignal Plugin (M) in the application's source code. Then, paste the API ID from item 2.2.3 in the box properties (N).

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**Figure S9:** Thunkable online environment with their respective section to add the plugin (M) and properties box (N) to paste the App ID.

#### **OneSignal Dashboard**

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**Figure S10:** Dashboard responsible for send notifications to the ITT app. Once logged, the administrator can select the target group (B) and write the notification by the message box (A).



Figure S11: Delivery section where is possible to view message's statistics.

#### **Sample Educational Modules**

The proposed app can be tailored to display any material considered appropriate for the students in a particular class. Although these materials are constantly updated, a good example of an open source text is:

- Chapter 10F in Analytical Chemistry 2.1, David Harvey, DePauw University, 2016 http://dpuadweb.depauw.edu/harvey\_web/eTextProject/AC2.1Files/AnalChem2.1.pdf

This can be also complemented by several educational articles and simple examples, where the technique is also discussed:

- Protein tryptophan accessibility studied by fluorescence quenching, Matías Möller Ana Denicola, Biochemistry and Molecular Biology Education 2002, 3, 175–178, (<u>https://doi.org/10.1002/bmb.2002.494030030035</u>)
- Primary and secondary inner filtering. Effect of K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> on fluorescence emission intensities of quinine sulfate, Sheryl A. Tucker, Vicki L. Amszi, and William E. Acree, J. Chem. Educ. 1992, 69, 1, A8 (<u>https://doi.org/10.1021/ed069pA8</u>)
- Fluorescence and Light Scattering, Ronald J. Clarke and Anna Oprysa, J. Chem. Educ. 2004, 81, 5, 705 (<u>https://doi.org/10.1021/ed081p705</u>)
- Fluorescence, Absorption, and Excitation Spectra of Polycyclic Aromatic Hydrocarbons as a Tool for Quantitative Analysis, A. M. Rivera-Figueroa, K. A. Ramazan, and B. J. Finlayson-Pitts, J. Chem. Educ. 2004, 81, 2, 242 (<u>https://doi.org/10.1021/ed081p242</u>)
- Fluorescence Spectroscopy in a Shoebox, M. Farooq Wahab, J. Chem. Educ. 2007, 84, 8, 1308 (<u>https://doi.org/10.1021/ed084p1308</u>)
- FluSpec: A Simulated Experiment in Fluorescence Spectroscopy, Stephen W. Bigger, Andrew S. Bigger, and Kenneth P. Ghiggino, J. Chem. Educ. 2014, 91, 7, 1081-1083 (https://doi.org/10.1021/ed400748d)
- Fluorescence Spectroscopy: A Rapid Tool for Analyzing Dairy Products, Charlotte Miller Andersen and Grith Mortensen, J. Agric. Food Chem. 2008, 56, 3, 720-729 (<u>https://doi.org/10.1021/jf072025o</u>)

## **Optoelectronics components**

The radiation source of our equipment it is a high-power ultraviolet Led that emits a narrow wavelength at 365nm. Wherefore, an excitation monochromatic filter is unnecessary. The optoelectronics components are fallowing in Figure 3.,





