ABSTRACT

Students and Geology scholars felt the need of a single tool that gathered all required application to compile their projects and didactic textbooks, since that so far it would be necessary to resort to a few different tools to achieve their goals. The requirements and details for each of the contents were assembled during several interviews with Professor João Cascalho from FCUL and four of his students. There was also the need to display those contents online, however without programming knowledge the production of HTML documents can become arduous. The use of Workbooks is a clever and innovative solution, yet they were inexistent in the scope of Geology.

Based on Kajero, it was possible to create a workbook with all the necessary applications where the user could easily produce interactive content like maps, plots and images focused on propagation and dissemination of Geology content and knowledge. This workbook, it’s an online editable notebook totally programmed in JavaScript that allows the easy addition of text in Markdown, code and the remaining desired contents. These contents can only function thanks to the APIs that were included and after the notebook is loaded with JSON databases.

Leaflet is the map API which includes zoom, markers, pop-ups and event manipulation. Grangraph uses NVD3, which includes and histogram, a frequency curve and a cumulative curve. The Ternary graph uses Plotly and both graphs were tailored to fit the needs stipulated. Lastly, Annotorious, an API that allows inserting images with comments or labels on them.

Key Words: Workbooks, Interactive Documents, HTML, JavaScript, Geology, Chart Libraries.

I. INTRODUCTION

The concept of workbook is traditionally applied to the areas of Programming and Mathematics, where authors interconnect text with code.

The idea of a workbook document (interactive and easy to develop) can also be applied in other areas if the appropriate APIs are added. In this study, the requirements and tools necessary for the propagation and dissemination of geology contents will be defined. An online tool will be developed that will allow the author to produce interactive content with maps, graphics and images.

“Casa das Ciências” [1] is an academic project to support teaching science in primary and high school that with the participation of university professors has built an online platform that contains several educational resources directed to various disciplines including Geology. Teachers and students of Geology felt the need for a unique tool that would unite all the applications considered by them necessary for the compilation of their projects, didactic and informative compendiums, since until now it was necessary to use different tools to achieve their objectives and computer skills in order for them to be interactive or to make them available on the existing platform.

So far, they have used tools such as Microsoft Word, Excel, and Google Maps, which in addition to the lack of practicality that implies this multiple use, each tool has limitations that condition the work produced. There was always the alternative of using some of the tools presented in this project or others similar to them, however these require understanding and programming knowledge that generates a barrier for many of the target users.

In the case of Microsoft Word, although it is one of the most used and complete programs for editing text and documents in general does not allow the insertion of interactive content as desired.

Regarding Excel, there were already templates and reference spreadsheets in which students would insert the data and a single graph was created that would then be transplanted into the document. However, it was intended that the graphs allowed the overlap of different samples thus facilitating the comparison between them when desired.

For image editing and placement of possible markers, Paint was used which causes an exhaustive repetition of the same image when various types of labelling are necessary or an excessive labelling of the same image, which is intended to be avoided in the result.

Finally, the georeferencing of samples carried out using Google Maps allowed only the placement of a simple pin, and the static map was copied through a screenshot and
Jumping from eBooks to Online Notebooks is performed due to the use of a programming language such as JavaScript or Python, languages that do not need compilation to run. Notebooks are mostly used for learning, testing code, or presenting data.

Notebook [3] documents contain inputs (input data) and outputs, plus additional text that accompanies the code, but is not intended for execution. In this way, notebook files can serve as a complete computational record of an analysis, interspersing executable code with explanatory text, mathematics, and rich representations of resulting objects (such as graphics). As most science is becoming increasingly computational, tools like Notebooks will help record and share the many calculations that an investigator will perform daily. In the long run, notebook web publishing will increasingly begin to be the natural way of how knowledge is created and shared between projects.

2) Notebooks in Education

So far, the use of Notebooks [4] has been mainly in the areas of programming, but also in physics and mathematics. With notebooks, students can quickly start using them to learn because they typically don't require installation, and materials previously taught by lectures can be made available online. Their existence encourages the creation of visual and interactive content to help explain complex topics and increases the availability of various topics through easy-to-use interfaces. When writing with text, code, and equations combined in the form of an executable and computational notebook this option is fundamentally different from current paradigms and it is worth exploring as a means of teaching advanced topics from other disciplines.

With the appropriate applications [5] allows users to explore code and data in a quick way through control manipulation in an interface more suitable for each discipline (buttons, sliders, etc.). Non-technical consumers, such as teachers and geology students, can explore and create without encoding a complete notebook, because of these same custom widgets developed using powerful JavaScript libraries, like d3.

B. Notebook Technologies

Kajero is a simple notebook at first glance, fully programmed in JavaScript and the document itself written in Markdown that is then converted to HTML. The biggest difference from this compared to the other notebooks is that it performs the entire process on the front-end, which means, on the user's side, without requiring the back end, so there is no need of a server for processing or to host it.

Markdown is a lightweight, easy-to-use and format language and was precisely created to generate stylized text using a minimum of elements.

II. LITERATURE REVIEW

A. Online Publications

Information technology has changed the way knowledge and data are processed, stored and disseminated. While the main purpose of a publication is to propagate new discoveries as widely as possible in a fast and efficient way, the main goal of an electronic publication [2] is to provide easy and quick access, using simple and effective searches that cannot be done on paper on the contents of the publications.

1) Workbooks/Notebooks online

Placed in the document as an image when there is the possibility of using an API that allows making multiple markers, labelling them, and the free movement we are used to.

The primary objective of this project is to create an online tool based on an existing notebook where, in addition to text and code, the user can easily produce interactive content like maps, graphics and images focused on propagation and dissemination of geology content.

This workbook is based on Kajero, an online editable notebook fully programmed in JavaScript that allows easy addition of text, code in various programming languages and line, bar, and pie charts. All this can be customized after the page is loaded and, depending on the options chosen, be rerun whenever the user wishes. It also allows data bases to be added from a web address without a specific data structure, which can be loaded and accessed in blocks of code, or to create charts.

Initially, the ability to add coordinates as a data entry was implemented to allow maps to be added in the same way as charts and access to those values anywhere in the workbook. The Map API is the leaflet that includes zoom, markers in different shapes and sizes, pop-ups, and event manipulation.

Additionally, two more chart types will be added. The first one is the Grangraph using NVD3, which includes a histogram, a frequency curve, and a cumulative chart, and the second is a Ternary chart using Plotly, both designed according to the stipulated needs. Both charts will be included in existing libraries and can be used in code blocks and charts.

Lastly, we’ll include Annotorious, an API that allows inserting images and comment or labelling into those same images. The ability to enlarge images and add other images to these annotations can also be added.

After the integration of these tools, buttons will be included that from JSON (JavaScript Object Notation) files the desired components be added with ease and without resorting to the code that behind transforms the data provided.

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1) Workbooks/Notebooks online
Kajero [6] is fully editable in the browser itself and can be saved as Markdown or HTML and should be able to be published as Gists, generating a unique URL for the created notebook, however this functionality is not available.

JavaScript code can run within the document itself, either when the page is loaded or only when desired and allows the code to be hidden and only the result is visible. This code is treated as a function and the variable returned by it are displayed below, whatever its format. The notebook allows to view arrays and objects in the same way as the chrome object inspector.

To add data sources, we can use the document itself or web addresses for JSON files, and these are automatically uploaded to the page and in both ways these variables can be used throughout the document.

Kajero also has some of the most commonly used graphics libraries, which allows the integration of some of the required graphics.

C. Presentation of data in Geology

1) Graphics

In the scope of geology there are several graphs used in data representation. For this notebook, two graphics are needed to create the projects in mind which were specifically requested. A histogram with frequency curve and cumulative curve for a representation of the granulometric distribution of the samples obtained in the field and two ternary graphs to characterize these same samples. For the construction of them it was necessary a better understanding of these terms and a search of the options available in existing libraries.

Granulometry or Granulometric Analysis [7] is the study of the distribution of the grain dimensions of a soil, that is, it is the determination of the dimensions of the aggregate particles and their respective percentages of occurrence.

The main objective is to know the granulometric distribution of the aggregate and represent it through a histogram or a cumulative curve.

The size scale defines the limits of the classes that receive names on the Krumbein phi scale (φ) [8], a change of the Wentworth scale [9], is a logarithmic scale calculated by the opposite of the logarithm of base 2 of the diameter of the particle in millimetres.

An histogram [10] give an approximate density of data distribution estimating the function of the density probability of a used variable. To build a histogram [11], the range of values needs to be divided into several smaller ranges and count how many values fall into each of these smaller ranges. These intervals must be consecutive, adjacent, non-overlapping and are often (but not obligatorily) of equal size.

If each range is of equal dimension, a rectangle is drawn with its height proportional to the frequency. An histogram is always normalized in a way that its total area is 1. If each of the intervals in the coordinate axis has always a length of 1, the resultant histogram is exactly equal to a relative frequency chart.

On the other hand, intervals can have various widths, since the rectangle drawn is defined in a way that area and frequency of cases are proportional. In this case the vertical axis represents density and not frequency. [10]

Rectangles should be drawn without spaces between them to demonstrate the continuity of the original variable.

![Granulometry chart](image)

Fig.1: Granulometry chart [12]

When there are too many points, the frequency curve [13] represents the boundary case of a histogram calculated by frequency distribution or to an approximation of it with the available points.

The progressive sum of these values along the axis allows the creation of the cumulative curve [14]. These curves are especially important for organized visualization of the data and in this specific case to characterize the soil from which samples are collected.

A ternary or triangular chart [15] unlike the usual plots it’s a three-axis chart in which all values contained in it the sum of its three variables will always be a constant, usually represented by 1 or 100%. Graphically the proportions of each value are defined by its position in an equilateral triangle.

These graphs are used in several scientific [16] areas to demonstrate the composition of systems composed of three species. Because the sum of the three variables is always a constant for all substances drawn, no variable is independent of the others so it is only necessary to know two of the variables to find the point of a sample and precisely because there are only two degrees of freedom it’s possible to draw the combination of all three variables in only two dimensions.
The concentration of each species is 100% in its corresponding corner and is 0% in the line opposite this. The percentage of a specific species decreases linearly with the distance to its corner. Parallel lines can be drawn between the 0% line and the corner for an easier reading of each variable.

2) Maps

Unlike the graphics in which we needed to build something quite specific, the map library needed for this project may be something more generic. It must have the tools to view a satellite image in order to display a realistic image, have some sort of markers and finally informative popups in those.

3) Images

For images the API desired is one that allows to add images with the potential to zoom in and demarcate areas and be able to write annotations. The following applications have the desired features varying mainly in working mode and visual aspects.

D. Widget Technologies

1) Graphics

One of the graphs needed for the project is Granulometry, the other is a ternary chart, a less common chart type of being found in existing libraries. This implies the use of libraries that allow customization, the freedom to mix existing graphics types that is compatible for the use of a web application in JavaScript and for free use.

D3.js [18] is a JavaScript library designed to manipulate data-based documents. D3 brings data to life using HTML, SVG, and CSS, with web standards in mind. It contains all the features of modern browsers without linking itself to a proprietary framework. D3 allows to associate arbitrary data with a Document Object Model (DOM) and then apply targeted transformations to that data to the document.

This library provides efficiency while manipulating data-based files. With minimal fixed processing, D3 is extremely fast, supports large datasets and dynamic behaviours for interaction and animation. It’s also possible to reuse code from the official collection and community-developed [19] modules due to functional style of D3.

Pre-built JavaScript functions can be used for elements selection, creation and style of SVG objects and graphical interface addition. These objects in turn can be widely customized using CSS.

Although, JSON is the most common used format, it is possible to use JavaScript functions to read other data formats, which allows data in multiple formats.

Inspired by Mike Bostock’s work "Towards Reusable Charts" [20] and supported by a combined effort by Novus and the community, NVD3 is a library that encapsulates D3 commands to create reusable graphics.

This project was created to build graphics and its components for d3.js but without removing the power and versatility it offers. There is a collection of components for the most commonly used chart types that with the help of the documentation provided allows customization of the same.

Plotly [21] is a technical computing company based in Montreal, Quebec, that provides data analysis and visualization online tools, like charts, analytics and statistics, for individuals and collaborations.

Plotly.js is a JavaScript graphics library that supports 20 chart types, including 3D graphics, geographic maps, statistical charts such as density charts and histograms, and most importantly for this project, ternary charts.

Plotly is much heavier than the remaining libraries sought and although it has fewer customization options, this library has a wider range of graphics available, which facilitates some of the work needed.

2) Maps:

Leaflet [22] is one of the libraries in JavaScript for maps with more downloads made. The code is open source and produces interactive maps compatible with mobile devices. With less than fifty kilobytes of code it is an extremely lightweight library, while having all the mapping features that most programmers need.

Leaflet is designed to be simple and efficient, responding to the most common needs of a map API. It has an excellent performance even in the simplest cell phone (a machine with less resources) and can be complemented with various plug-ins.

The API is user friendly and well documented, with the help of many contributors, which allows the code to be clear and easy to understand.
This program allows us to upload a map to our choice within several available on the website, add various bookmarks, polygons and popups and respond to events related to all of these.

3) Images:

Annotorious [23] is a web image annotation tool with open source code. It is a result derived from the EU-funded EuropeanaConnect project and allows anyone who maintains a web page to transform images of their site into collaborative drawing and communication screens. Annotorious integration [24] is relatively simple and allows users to select part of an image and leave a text comment in it, with the appropriate plugins even saving them. Annotorious’s plugin system is flexible, through which the API can be customized to meet specific project requirements.

It is quite intuitive to use and allows multiple sets of annotations to be loaded at a time if previously saved. Each of the annotations can have its own content, these messages can be plain text or enriched by HTML, creating links or even uploading other images.

III. Kajeo

A. Requirements

This project is designed to be used by teachers and students in the geology area. This implies creating workbooks from scratch, for this purpose, the program which will have as final form a web page, must be easily manageable by anyone without programming skills and without access to specific programs or development environments for this type of projects.

The construction and editing of workbooks cannot be delimited by the HTML or JavaScript domain although the page allows the use of these two languages and its full potential. Any individual with their own computer should be able to edit these pages and having access to the program on your machine avoids the need for any server to run and the page created.

The page must be intuitive to use, with clear options and no large margin of error, with results quickly visible and with the possibility of going back in case of any misunderstanding.

Pages must be able to contain various types of media for the desired workbooks. In the documents made in this discipline the contents used are from simple text, to georeferenced maps with pins, photos of the samples with the possibility of adding notes and zoom, granulometry graphs and ternary plots.

The requirements and details for each of the contents were acquired in the various interviews with Professor João Casalho of the Faculty of Sciences of the University of Lisbon and some of his students, namely Bruno Lamorosa, Emanuel Gandaio, João Pontes, Sara Pereira who used the content of her group work to create a page using the program and without which it would be impossible to achieve the final result.

B. Implementation

Of the various programs found and tested, Kajero was the chosen notebook. It is the notebook with the structure and design best suited to the desired project.

Fully programmed in JavaScript allows easy integration of the libraries used for the desired content. The structure of the workbook is very intuitive and with the addition of specific buttons for each purpose does not generate any doubt.

Text written in Markdown is preferable rather than using only HTML because it was precisely created for writing online documents generating stylized text using a minimum of elements.

Allows it to be edited and saved without use to any server and that the desired changes to an online page be exported to another document.

Using React.js, a JavaScript library to build user interfaces, the original Kajero had these four modules. The data manager and persistence module were maintained due to its operation being extensible the changes made.

![Fig. 3: Simplified representation of Kajeo architecture](image)

The data manager ensures that the links added or variables written in each code box are kept available throughout the document, and the JSON added through the links are available in the variable "data".

The persistence module is what transforms the workbook to Markdown or HTML, which allows saving the work done and share it. These "translators" work correctly with the functions added because these are added to the document in the form of functions in JavaScript.

In the original workbook we have only three buttons available, the text and code button that have been kept and
the graphics button that was removed for the sake of consistency by the boxes created by the new buttons. Eight buttons have been added for the different purposes that in turn create the necessary boxes for the insertion and visualization of multiple content.

The text button creates only a simple box with its content that after written in Markdown is converted to HTML. All other buttons create this "container", or box:

![Code Container](image)

**Fig.4: Simplified representation of a code box in Kajero**

The buttons include "play/refresh" to run the code in it, "gear/user/secret" that defines the way the code is run, which is automatically when loading the page, by user command, or automatically with the code hidden. We also have "up" and "down" arrows to move the container and the "delete" to erase the box.

The only button in the result box is the "refresh" and only appears if the code is hidden.

In the original workbook the "gear" is the default mode, when a code box is created the graph block becomes "hidden", that is, has this attribute on its partition that allows it to stay hidden and its SVG was used to draw the graphics when any of previously existent the graphics were added.

In the boxes directed to Geology the graph block is not used for the sake of customization and consistency, instead a block of text is created outside the code box with the HTML code required to display the object created. The identifier is generated and automatically inserted into the function and embedded in the code box, manual changes can be made, but are not advised as it might occur a conflict with the remaining boxes. This allows the positioning in the document to be customized.

The default operating mode in KaGeo is secret so that the function is not displayed. A code block help button has also been added that allows you to fill out a form for each content type to automatically generate the function.

For the granulometric graphs, the NVD3 library that was already added was used and a specific model was created for this purpose. This implied the combination of two different chart models, the normalization of their scales and a shift of the bar chart to meet the requirements of the granulometry, which implied that the frequency chart point was in the centre of the bar for each value. Some customizations were made for the chart to be in encounter with the desired aesthetic idealizations. A function was also written that allows the choice of data, which scale is intended, whether 0.5 or 1, the boundary on the axis of the coordinates and the possibility of changing the settings of the selected samples.

Similarly using the Plotly library, a template was created for a ternary chart specific to this purpose based on the scatter ternary chart. The function added to facilitate its insertion in the document allows the choice of data, whether the graph is a "Sand, Clay and Silt Diagram" or a "Gravel, Mud and Sandstone Diagram" and the possibility to change the settings of the samples Selected. In these graphs, shaded areas were added that describe the samples in each zone for these two types of graphs. Likewise, some customizations were made so that the chart would be in encounter with the desired aesthetic idealizations.

For maps, the Leaflet library was used, which with the written function allows you to choose the map from the data added to the document and create 3 different map types made at the request of geology teachers. The map can be simple without markings or with a translucent circle in a larger area to delimit an entire sampling area or to have each of the collection locations individually marked with a smaller, more appealing smaller pin. Pins can be selected individually, and the zoom described in the data file changed on the workbook itself.

Finally, the library for the images used was Annotorious, along with three functions. The first that allows you to initialize the images, whether they are annotable or not. The second, adding the desired annotations to the image by removing any others previously marked. This allows the same image to be used to annotate different sets of annotations without it becoming excessively obstructed. The third function exists only to make it easier to read annotations done during document creation to know the values with which to fill the data source.

The first thing to define when you want to create a workbook are the data sources. These are written in JSON and although it does not require any programming knowledge is a format with some particularities. Data sources can be entered locally in the document itself in a code box or through a URL and inserted at the top of the page to be available throughout the document.
After these data sources are added to the workbook the content can now be added. By clicking on any of the available buttons, boxes will be added to the document. These boxes can be text or code, text boxes allow text to be entered and can be edited in Markdown or HTML. Code boxes allow code written in JavaScript to be run and any of the functions developed for this project. In each of the specific boxes for each feature there is a help button that allows through filling out a form the exact intended result to be achieved.

Then, by clicking on the question mark, opens a form that allows the choice and customization of chart. After choosing the file and the desired data (the Ctrl or Shift key can be used to choose multiples samples) we have a menu where we can customize the scale, the limit on the x axis, and the different bonuses for each sample (if you don’t want to change anything, the default mode includes all datasets with the possibility for them to be removed).

The chart is automatically initialized, and the final function appears in the code box. This happens for all the new content types.

From the same set of values that can be inserted either as absolute values, which are then normalized, or directly as percentages, a histogram, frequency curve and cumulative curve are drawn. These charts have the x axis boundary variable and allow the choice of scale between 0.5 and 1 and selection of the colour of the charts. It also allows to change the initial state of these charts, being able to remove certain parts of the charts or simply hide them and define whether this state can be changed when it is clicked in the label.

This chart is publicly available on Github at https://github.com/JoaoNGoncalves/nvd3.

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This chart is publicly available on Github at https://github.com/JoaoNGoncalves/nvd3.

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**Fig. 5: Process for creating a JSON for data source**

**Fig. 6: Process for creating a workbook**

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**IV. RESULTS**

**A. Granulometry Chart**

To add a Granulometric chart you first must click its button. This button will add two boxes, one text to demarcate the position of the chart and the other with the code to create it.

**Fig. 7: Granulometry Graph with Multiple Samples**

**B. Ternary Chart**

Plotly already had a ternary model, however it was an empty canvas that with the model created facilitates its use even outside the scope of geology. This model allows the insertion of non-normalized values and inserts a colour of the same pallet as the granulometric chart and symbols for the samples are randomly selected. In the scope of geology, the two types of graphics developed are especially useful, and can easily be added to the program.
This chart is also publicly available on Github at https://github.com/JoaoNGoncalves/TernaryPlot.

C. Mapa

Maps are completely interactive, allow a selection of pins, and text in these can be enriched with HTML in order to have links, for example:

![Type 1 map (sampling zone selection)](image1)

This is the type 1 map that displays the entire sampling area and the following is the type 2 map that zooms in and contains all the points where the samples were collected. These samples can be manually chosen to be presented only for the desired points, this can facilitate consultation at some overlapping points or simply to highlight the chosen points.

![Type 2 map (pins at the locations of the various samples)](image2)

D. Imagem

Images can be added with or without annotations. Annotations can be grouped together to appear separately or all together with different annotations. In these annotations we can insert images through HTML so that we have access to zoom.

The annotation reader is created to make it easier to read the annotations entered during document creation to know the values with which to populate the data source.

![Image with Annotations](image3)
E. Multiple Choice

A) Muito grosseira  
B) Grossa     
C) Média       
D) Fina       
E) Muito Fina

Fig. 12: Multiple choice example

To approach the real needs of Teachers and students, the creation of multiple choices constituted, for us, as an extra. In this way we extend the potential of the tool, enhancing the self-assessment of students in the learning process. The first code box initializes the responses and the second checks the inserted response.

All these demos are available at http://web.ist.utl.pt/~ist16946

V. Evaluation

In addition to the initial requirements the charts were changed as requested until the optimal result was found. The two types of maps with pins were created on request and changed until the demarcations with the desired sizes and shapes were achieved, in the permanent satisfaction of process indicators.

For the images, it was asked that certain annotations could be grouped and that the previous ones were removed when new ones were called and that request was fulfilled, however the zoom is not easy to use. For now, the only way to do this is by inserting the image through HTML into the annotation, however the ideal would be to use the plugin with OpenSeadragon, which it will require some reformulation of it.

Data sources may be added in the future in a more simplified way or using another user-friendly program. It may also be important to add a language option that not only changes the site itself, but also the options in the charts that at the request of teachers have axes and the prefixes of the names in the labels in Portuguese.

In this dissertation, all the objectives that had been proposed were achieved. During this project, a presentation was made by the students of Prof. João Cascalho, Bruno Lamosra, Emanual Gandaio, João Pontes, Sara Pereira. Whose content was inserted into a workbook and made available for the presentation, with very positive response and results, where we could see the potential of using Kajero.

Document URL: http://web.ist.utl.pt/~ist169466/Workbooks_for_Geology_2.html

This document was produced before the creation of the forms and, therefore, a glimpse of the necessary code can be seen and the potentialities of using it to add these different types of content in the workbook.

VI. Conclusion

“Casa das Ciências” has an exceptionally complete platform of various educational resources directed to various disciplines including geology, however, requires understanding and programming knowledge to create documents for it.

Teachers and students of Geology felt the need for a unique tool that would unite all the applications considered by them necessary for the compilation of their projects and didactic and informative textbooks, since for this it was necessary different tools to achieve their objectives.

From Kajero, a workbook by Joel Auterson it was possible to create a workbook with all the applications needed to create a platform that meets all requirements, where the user can easily produce interactive content such as maps, graphics and images focused on the dissemination and propagation of geology content.

This workbook is an online editable notebook fully programmed in JavaScript that allows easy addition of text in Markdown, code in various programming languages, and event manipulation. Grahgraph uses NVD3, which includes a histogram, a frequency curve, and a cumulative chart. The second chart, Ternary uses Plotly, both designed according to the stipulated needs. Lastly, Annotorious, an API that allows you to insert images and comment or labeling into those same images.

The requirements and details for each of the contents were acquired in the various interviews with Professor João Cascalho of the Faculty of Sciences of the University of Lisbon and some of his students, namely Bruno Lamosra, Emanual Gandaio, João Pontes and Sara Pereira who used the content of her group work to create a page using the program and without which it would be impossible to achieve the final result.

Thus, all the objectives that had been proposed were achieved, since the FCUL group included in their presentation of its project a workbook with the information acquired for their presentation, with very positive response and results. Alongside this, possible improvements and future work were also outlined on the now existing platform.
References:


