

Virtual basic psychology laboratory: experience as the key to learning

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Abstract

The Virtual Basic Psychology Laboratory (VBPL) is a tool that accompanies the student on a journey through experiments that have become classics in the Cognitive Psychology field. The platform reproduces experiments from the study of emotion, language, memory, motivation, thought and perception.

In each experiment, the VBPL presents an introductory text with some articles for reference, where these experiments were suggested for the first time.

The VBPL is based on the Moodle e-learning platform, which enables each student to have their own space for saving the data, results and analysis that they have produced. All interaction with the system is recorded and can be consulted by both the student and the teacher at any time. This also enables the VBPL to be used as an assessment tool by the teacher.

The platform can be accessed at the following website: <http://psico193.uab.es/lvpb>.

General area of interest of this innovation

This resource is especially aimed at Basic Psychology teachers, and practical teachers in particular. It is also an interesting resource for anyone wishing to learn some of the foundations of Cognitive Psychology by means of a series of classic experiments in this area which have been carried out over the last century.

1. Objectives

Universities have gradually been introducing tools for distance learning for some years. Of particular note within the knowledge area of Psychology has been the emergence of virtual laboratories that enable experiments to be carried out using computers, with no need to use the expensive infrastructure of experimental laboratories.

The proposal presented here is the first Virtual Basic Psychology Laboratory (VBPL), which contains some of the most typical experiments of the various basic processes psychological in the Catalan and Spanish languages. The main reason for the project was the need to reconsider the current methodology used for teaching some Basic Psychology courses. Much of the knowledge taught on these courses comes from experimental results, when means that the infrastructures necessary to allow all the students to carry out experiments must be available. In the majority of cases, this is very costly and inefficient. The VBPL is a feasible alternative to these limitations.

The VBPL is a tool that makes it possible for students to learn the key concepts of Basic Psychology based on their involvement in the knowledge construction process. To that end, the VBPL has all the materials necessary for students to acquire the necessary knowledge. The platform enables up to 10 different experiments to be carried out, the results obtained individually or as a group to be analysed, graphic depiction of these results, the original works where these experiments were presented for the first time to be read and scientific reports on the experiments carried out to be written.

The specific objectives of the VBPL are:

1. To develop the capacity to obtain knowledge based on one's own experience by means of performing experiments and the information available on the platform.
2. To contribute to the acquisition of instrumental skills (the ability to organise and manage information and to resolve problems arising during the experimental procedure).
3. To enable Psychology students to carry out experiments and data analysis anywhere and at any time.
4. To promote learning among equals by stimulating scientific exchange among users of the platform
5. To make a tool available to Psychology teachers enabling them to organise their practical classes in the environment of experiments and real data.

2. Description of the project

2.1. Context of the project

The Virtual Basic Psychology Laboratory (VBPL) is a joint project between the Universitat Autònoma de Barcelona and the University of the Balearic Islands, which

enables experiments to be designed, executed and their results analysed. The most immediate precedent for this project can be found on the web platform on visual illusions and thought (<http://psicol93.uab.es/ilusions>) which some teachers involved in this project had developed. This platform on illusions presents the effects of illusions in an educational and comprehensive manner, in order to encourage the deduction of explanations by students based on interaction with the Internet platform. The aim was also for the VBPL to contribute to developing the ability to obtain knowledge from one's own experience and to acquire instrumental skills.

2.2. Characteristics of the VBPL and the materials developed

In order to attain these objectives, it was necessary to define a «minimum journey» that the students would take on the platform. This «journey» had to promote the acquisition of instrumental skills when deducing the procedure for obtaining the results of experiments. In order to encourage progressive learning based on interaction with the platform, various phases were defined for each experiment presented in the Laboratory. The basic learning unit of the VBPL is «an experiment», and each experiment contains 3 distinct phases: presentation, execution of the experiment and analysis of results.

- a) **Presentation:** this consists of the written introduction to the experiment in order to act as a leveller of the knowledge related to the questions that were the reason for the experiment in question. This objective is achieved by text presenting the experiment (written by teachers specialising in the subject) which is also used to present the original article in which the experiment was carried out for the first time. The platform contains all the original articles in PDF format, as they are part of the material necessary to study the key concepts of the experiment in depth.
- b) **Experiment:** consists of the student carrying out the experiments as a subject. The student can perform any of the experiments available as many times as he/she considers necessary. All the experiments are implemented in Flash Macromedia language, which enables accurate measurement of the data generated by interaction with the student (such as reaction time). The platform records each interaction with the student by the experiment, generating an experimental record. Various tests make up a session, in which the specific execution results (the independent and dependent variables of each test) and the general data (time, student's name, experiment performed, etc.) are kept. This enables the student not only to collect data from various sessions that he/she has executed, but also provides the opportunity to obtain data from various participants.
- c) **Results:** This phase shows three tabs with different functions that are explained below: «Analyse», «Graphs» and «Report» (Figure 1).

Analyse: the VBPL presents a dynamic matrix of data for each experiment that makes work with data possible (ordering and removing cases and producing graphs)

Figure 1. Screen showing phase 3 of the Stroop experiment. In this case, what a student who has performed just one experiment session on 26 October 2007 would see is shown

Stroop clásico

Analizar Gráficas Informe

Usuarios Seleccionar

<input type="checkbox"/>	Id	Nombre
<input checked="" type="checkbox"/>	8	para pruebas, Usuario

Nº Usuarios = 1

Sesiones Seleccionar

<input type="checkbox"/>	Usuario	Sesion	Fecha Inicio	Fecha fin
<input checked="" type="checkbox"/>	8	1283	26-10-2007 16:47:37	26-10-2007 16:48:50

Nº Sesiones = 1

Ensayos Generar Gráfica Descargar datos: CSV EXCEL

<input checked="" type="checkbox"/>	Orden	Usuario	Sesion	Fecha	Posición	Tamaño	Condición	Palabra	Color	Respuesta	Acierto	Tiempo Reacción
<input checked="" type="checkbox"/>	1	8	1283	26-10-2007 16:47:39	8	40	congruente	rojo	rojo	rojo	1	458
<input checked="" type="checkbox"/>	2	8	1283	26-10-2007 16:47:40	6	60	incongruente	rojo	amarillo	amarillo	1	569
<input checked="" type="checkbox"/>	3	8	1283	26-10-2007 16:47:41	1	60	incongruente	azul	rojo	azul	0	440
<input checked="" type="checkbox"/>	4	8	1283	26-10-2007 16:47:43	9	60	congruente	azul	azul	azul	1	617
<input checked="" type="checkbox"/>	5	8	1283	26-10-2007 16:47:44	1	20	congruente	rojo	rojo	verde	0	559
<input checked="" type="checkbox"/>	6	8	1283	26-10-2007 16:47:46	3	40	incongruente	amarillo	azul	azul	1	630
<input checked="" type="checkbox"/>	7	8	1283	26-10-2007 16:47:47	5	20	congruente	verde	verde	verde	1	492
<input checked="" type="checkbox"/>	8	8	1283	26-10-2007 16:47:49	4	20	incongruente	amarillo	rojo	rojo	1	741
<input checked="" type="checkbox"/>	9	8	1283	26-10-2007 16:47:50	9	40	congruente	rojo	rojo	rojo	1	440
<input checked="" type="checkbox"/>	10	8	1283	26-10-2007 16:47:52	1	40	incongruente	verde	amarillo	amarillo	1	663
<input checked="" type="checkbox"/>	11	8	1283	26-10-2007 16:47:53	7	40	incongruente	azul	verde	verde	1	659
<input checked="" type="checkbox"/>	12	8	1283	26-10-2007 16:47:54	6	20	incongruente	amarillo	rojo	rojo	1	600
<input checked="" type="checkbox"/>	13	8	1283	26-10-2007 16:47:56	4	40	congruente	verde	verde	verde	1	516

Nº ensayos = 48

so that the student begins to deduce possible relationships between the variables in the experiment. This process is essential for learning the concepts and for this reason, the student is guided in this search for relationships by the help tables and introductory text provided in the presentation phase of the experiment. During this phase, the student has a specific help text which will guide him/her through the analysis of data.

Graphs: in this phase, the VBPL enables various graphic depictions of the results to be generated based on the data selected beforehand in the matrix. These depictions can be left and recovered at any time in the «Graphics tab».

Report: The VBPL has a function that enables an online scientific report to be written for each experiment, according to the patterns and sections of a classic scientific report. To do so, the VBPL presents the student (after he/she has analysed and graphically depicted the results) with a text editor and a template providing guidance with writing the report. After the student has finished writing the report, he/she can press a button that shows that the teacher can read it. At the same time, the teacher

will receive notification that he/she has reports to assess, and has the opportunity to give feedback and make comments and to assess it with a grade. The VBPL therefore also contains a useful and efficient assessment tool.

2.3. Contents

At present, the VBPL consists of ten experiments that are illustrative of the main psychological processes (memory, language, motivation and emotion, attention, perception and thought). The specific experiments in the VBPL are shown in Table 1.

Table 1. Experiments currently available in the VBPL

Experiment	Process	Article reference
Meaning and Memory	Memory	Moscovitch and Craik (1977)
Contrast Sensitivity Function	Perception	Campbell and Robson (1968)
Mental Rotation	Perception	Shepard and Metzler (1971)
Emotional Stroop	Emotion	McKenna i Sharma (1995)
Iowa Test	Emotion	Bechara, Damasio, Damasio and Anderson (1994)
Classic Stroop	Attention	Stroop (1935)
Flanker Compatibility	Attention	Eriksen and Eriksen (1974)
Lexical Decision Task	Language	Forster and Chambers (1973)
Anchorage	Thought	Tversky and Kahneman (1974)
Framing	Thought	Tversky and Kahneman (1981)

2.4. Use

There are 9 courses involved in the VBPL: 4 at the UAB (Attention, Perception and Memory, Motivation and Emotion, Psychology of Thought and Language, and Principles of Psychology) and 5 at the UIB (Memory, Perception, Attention, Motivation and Emotion, and Introduction to Psychology). For this reason, the VBPL is flexible and allows each teacher to adapt it to the course objectives. The *Moodle* platform on which the VBPL has been created enables new courses to be produced, which means that teachers can add or remove content, thereby adapting a new VBPL course format using the experiments and activities that they select.

The VBPL is aimed mainly at students of these subjects. However, it is material that is open and accessible to other students and Internet users in general (although guest users have less functionalities available to them than a user registered on a course).

The VBPL web platform is implemented on *Moodle*. *Moodle* is a course management system designed for distance learning. This system enables the creation of virtual courses and student-teacher interaction in various ways (wikis, forums, questionnaires, file exchanges, links to web pages, etc.) The Student always works with a *Moodle* interface, which is very intuitive. It can be viewed at [\(http://psicol93.uab.es/lvpb\)](http://psicol93.uab.es/lvpb). (2008) In order to enter as a registered user, it is necessary to complete a short questionnaire giving a user name and password which enable the student to be identified throughout his/her interaction with the VBPL.

3. Methodology

The main initiatives carried out during the development of the VBPL can be summarised as four phases.

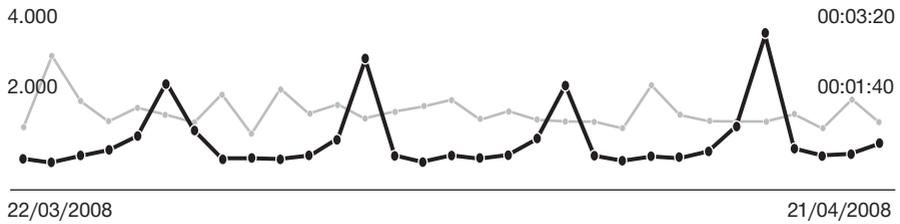
First, the general structure of the VBPL was defined. This included definition of the general phases on the journey of an experiment, interaction with the student and the opportunities for the platform to measure the experiments. The second phase covered the choice of experiments and the specific implementations required by each experiment. The third phase covered the technical assembly of the interactions in each phase. This assembly required specific knowledge of *Moodle*, *Flash* and *PHP* language. Finally, the last phase of development involved creating the texts accompanying each phase of the experiments (presentation, instructions for the experiment and help in analysis of the results) and writing the VBPL Users' Manual.

4. Results

The VBPL has been available since December 2007. Only teachers who participated in the project have been permitted to open courses during this initial trial phase. The VBPL will be open to teachers all over Spain from September 2008 onwards. This total opening phase of the VBPL means that it will be possible for any psychology teacher at a Spanish university to ask for their course to be opened in the VBPL. It is therefore important to stress that the results presented below come from this initial trial phase and must therefore be considered as preliminary.

There are currently 12 fully operational courses in the VBPL with a total of registered 753 users. To have some idea of the approximate size of the traffic, some of the figures for the last month (between 22 March and 21 April) can be used as an example. In that month, the VBPL recorded a total of 1393 visits, which led to a total of 17,629 pages being visited. This shows that in the medium term, each student that entered the VBPL visited approximately 13 pages and remained connected for an average of 11 minutes. In other words, less than one minute was spent on each page (see figure 2).

Figure 2. Daily changes in the amount of pages visited by all users (in black) and the average time spent on the page.



As regards the time taken for each visit in this period, the distribution of visits by duration is shown in figure 3. This figure shows that approximately 15 % of visits last less than 30 seconds (i.e. they are not real visits) while most visits last between 10 and 30 minutes (enough time for a student’s visit).

Figure 3. Distribution of the duration of visits to the VBPL during the period between 22/3/2007 and 21/04/2008.

Duration of visit	Visits	Percentage of all visits
0-10 seconds	104	7.47 %
11-30 seconds	124	8.90 %
31-60 seconds	104	7.47 %
61-180 seconds	175	12.56 %
181-600 seconds	296	21.25 %
601-1.800 seconds	458	32.88 %
1.801 + seconds	132	9.48 %

96.85 % of these visits come from direct traffic. This means that users do not come to the VBPL from another page, but instead mostly write the address directly in their browsers (undoubtedly on the instructions of their teachers who give the http address during face to face classes). A more specific overview of the use of the VBPL can be obtained from an analysis of some qualitative indicators for a specific course. For example, the Perception course at the University of Balearic Islands offers a VBPL activity as an option. Of the total of 80 students on the classroom course, 50 accessed the VBPL at least once. Of these 50, 39 succeeded in executing at least one complete experimental session (20 % withdrew). The real produc-

tion of these 39 students can be seen in 68 graphs and 20 scientific reports (both products are placed in the VBPL, associated with each user, and are available to the teacher at all times). From the qualitative point of view, the teacher gave a very positive assessment of the use of the VBPL on his course, in terms of both ease of use and the relationship with the learning objectives that had been established for this activity. In any event, it should be borne in mind that we still have no specific comparative study that enables us to confirm the differences in learning after the introduction of the VBPL on a specific course. Studies of this type are planned for the second year of use of the platform.

5. Conclusions

By way of a conclusion, it can be said that the preliminary results currently available predict a high level of use of the VBPL by Basic Psychology teachers. We feel that the VBPL will have a great deal of impact on the implementation of teaching, mainly in practical sessions.

Furthermore, its use in practical sessions in core subjects enables improved the co-ordination of content between various subjects. We also feel that it will reinforce students' motivation.

In short, we expect the VBPL to contribute to the learning and understanding of various psychological processes, as well as becoming a useful tool for students to learn from their own experience.

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Interesting links

- Innovation website <http://psicol93.uab.es/lvpb/login/index.php>

Keywords

Virtual laboratory, experiments, cognitive psychology, virtual Campus.

Financing

AGAUR round (University and Research Grant Management Agency): Grants for financing projects for the improvement of quality in Catalan universities for 2006 (MQD) opened by Resolution UNI/53/2006, of 11 January. Date of ruling: 14 July 2006. File No: 2006MQD00068.

Basic Psychology Department of the UIB, and Basic Psychology Department of the UAB.

Supplementary materials on the CD-ROM

Web demonstration of the LVPB and virtual tour of different experiments that have become classics in cognitive psychology.

Project leader

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Presentation of the working group

The team that undertook this project consisted of 13 basic psychology teachers at the UAB and the UIB, one research fellow and 3 computer technicians.

The management of the project was the responsibility of a smaller group of people consisting of 4 teachers (3 from the UAB and one from the UIB, the project's research fellow and the head computer technician. This group of workers remains active, working on platform maintenance tasks. The complete list of members of the group and their tasks within the project can be seen on the platform's home page.

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