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To define

COMPUTER-HUMAN INTERACTION IN LEARNING AND INSTRUCTION CHILI

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Abstract

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1 Introduction

This project is trying to reveal if the psychological features of a person could determine the best path of activities he should take in order to maximize his learning gain. We tried to that purpose a set of different questions that could be related to different features.

- Two questions of IQ tests that would be grouped together in a column named "IQ". -1 was attribute to any wrong answer and +1 was attributed to the good answer.
- Ten personality questions from the International Personality Item Pool ¹. Five questions are related to the conscientiousness of a person and five questions related to the openness of a person. In each case, three items were positively marked and two negatively marked. For this part of the test, the answer varied from "I strongly disagree" to "I strongly agree" and the points ranged from 1 to 5 or -1 to -5 in the case we gave negative marks. The result for the consciousness was stored in the column named "conscious" whereas the openness' results was stored in the column named "open".
- Five questions related to the logic and the imagination capacity of a person. These five questions were taken from the paper folding test ². +1 was attributed to to the right answer while -1 was attributed to a false one. The results were stored in the column named "paperFolding".
- One question about the academic level of the test taker. The possibilities to pick from were: "Haven't graduated high school", "High school graduate", "Apprenticeship", "College student", "Bachelors", "Masters", "Doctorate". The answers in this order were assigned a number from 1 to 7. The results were stored in the column named "level".
- One question about the gender of the person. We asked if the person was a Male or a Female during the first test the user had to accomplish and the answers were stored in the column named "gender".
- One question asking in which country the test taker is living.

One other implied feature when taking the test, could be the time a person takes to accomplish a test or an activity or the whole experiment.

The experiment is a website that guides you through different steps in a precise order explained in the section "Web platform". The goal for this website is to teach a new concept through different paths assigned randomly and in a uniform way to each visitor of the page.

¹<http://ipip.ori.org> The Big-Five Factor Structure

²<http://steinhardtapps.es.its.nyu.edu/create/assessment/vz2/start.html>

At the end of the experiment, we also ask questions about how the test went and how people felt about it to have additional information that could infer relevant features.

The user of the page, is asked the same set of questions about the theme of epidemics before and after he learns about it so that we could calculate the learning gain of a person as the difference between the scores he gets at the two tests.

2 Learning platform

In order to gather the data for our analysis, we had to develop a learning web platform³ coded in Django. In the following sections we would call user a person that participates to the experiment.

2.1 Components

1. The registration form: It is the first step is to register with the email and the age. The email is an assertion that the user has a unique identifier. A user could take only once the test in order to have to measure his learning gain when he goes only once through the teaching activities. Note that the user is free to have the learning activities more than one time during this one time experiment.
Doing the experiment only one time permits us to measure the time it takes a person to go through all the steps.
2. The psychological test: The questions of this test are enumerated in the introduction and the answer of the user to them constitutes the features that would help us to search for patterns among people and to imply the best path for them to improve their learning experience.
3. The pretest: It is the same as the post test and it's composed of six questions with different degrees of difficulty about epidemics, the theme treated in the learning activities
4. The activities: There is two successive activities each one aims to teach on concept. The first concept is the epidemic's definition and causes and the second one is the epidemic's reproductive number. Each concept could be explained with a video or a text. In that way, we had four different teaching paths: text-text, text-video, video-text, text-text.
5. The post test: already explained in pretest.
6. The assessment form: It is constituted from some of the NASA-TLX ⁴ questions and gathering the opinion of the user about different aspects of the

³<https://github.com/chili-epfl/learning-platform>

⁴<http://humansystems.arc.nasa.gov/groups/tlx/>

experiment taken. This questionnaire is known as an assessment tool that rates the perceived workload in order to assess a task.

3 Data Description

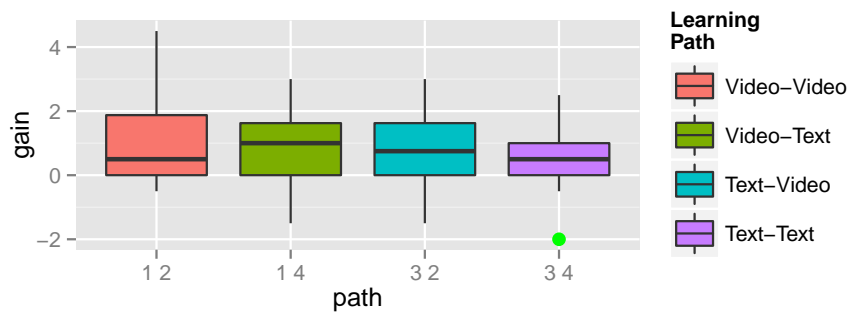
We gathered 167 participants but only 77 of them accomplished both pre and post tests and went through all the experiment steps (from the registration to the assessment form). As our goal is related to the learning gain, we work with these 77 users. Among them, we have 25 female user and 52 male user. We have also the following distribution for the possible learning paths:

- 27 users for text-text.
- 20 users for text-video.
- 12 users for video-text.
- 18 users for video-video.

4 Data visualization

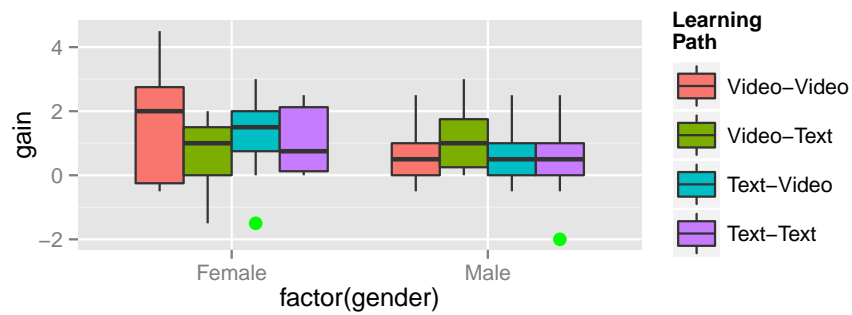
We visualize the box plot of the learning gain as a function of the learning path showed in figures ?? and we don't see a significant change in the learning gain that could lead us to say that some path is always good for all types of learners.

Figure 1: titre



Then we tried to find out if there is a clear correlation between some feature and the learning gain. We obtain the following graph

The results cannot be trusted because of the high proportion of males regarding to the number of female participants. But we can see that the video-video path and the text-video path worked better for females whereas video-text path was more successful around males.



5 Conclusion

[1] Le terme grand public serait ici quelque peu galvaudé et prétentieux. [2] Des exemples existent pour des déclarations de cyberguerre entre des organisations et des Etats (cf. League of Undergrounds). [3] John Arquilla and David Ronfeldt, “Cyberwar is Coming!”, Comparative strategy, Vol. 12, Springer 1993