

*Usability Analysis of eLearning
Applications through Eye-Tracking:
a Study on iCorsi2, a Moodle-Based LMS*

Research Purposes

- Evaluate the **usability degree** of iCorsi2;
- Investigate the **main drawbacks and limitations** of the platform design;
- Determine the main **factors affecting the quality of interaction** between users and platform;
- Develop a **set of guidelines** to improve the **platform usability performance**, allowing users to navigate with effectiveness, efficiency and satisfaction (ISO 9241).

METHODOLOGY

Data Collection

- **Methods → User Testing**
 - Two Eye-Tracking Tests (Students and Teachers)
 - Questionnaires → Pre-Test and Post-Test
 - Observation (Tobii Studio Software “Live Viewer”)
 - Cued Retrospective Think Aloud

- **Sample:**
 - 20 participants
 - Divided into two groups → 10 teachers and 10 students
 - Coming from all the USI faculties

- **Apparatus:**
 - Tobii X2-60 eye-tracker
 - Tobii Studio Software version 3.2

- **Tasks:**
 - Different for the two sample groups
 - Chosen in agreement with USI eLab

Teachers' Tasks

T1: Login and Profile

- *Login on the iCorsi2 platform*
- *Visit your profile, modify a variable and save the changes*

T2: Course Editing

- *Modify the name and the starting date of the Course “Eye-Tracking”*

T3: Enrolment Key

- *Insert a Course Enrolment key*

T4: Users Enrolment

- *Enrol X as student*
- *Enrol Y as teacher*

T5: Forum

- *Post a message on the Forum*

T6: Assignment Evaluation

- *In the same course, give an evaluation to the assignment uploaded by a student*

T7: Course Structure and Label

- *Change the course structure from “weekly format” to “topics format”*
- *Change the title of “Topic 1”*
- *Add a Label and upload the image “Eye-Tracking” inside it*

Students' Tasks

T1: Login and Profile

- *Login on iCorsi2 platform*
- *Visit your profile, modify a variable and save the changes*

T2: Upload Assignment

- *Enrol in the course entitled "Eye-Tracking Students"*
- *Inside the section "final exam", upload the assignment "iCorsi" that you find on the desktop*

T3: Group Choice

- *Choose the group that you want to join*

T4: Forum

- *Post a message on the Forum*

T5: Quiz

- *Answer to the questions of the Quiz and check your answers*

T6: Navigation

- *Open the folder "Varie Immagini", check what there is inside and go back to course homepage*
- *Enter in the Forum and open the message that you have just posted*
- *Enter in another course in which you are enrolled*
- *In this course, check who are the participants and find out only who is the teacher*
- *Come back to the "Eye-Tracking" course and unsubscribe*

Data Analysis

- **Analysis of Observation Data:**
 - Making first usability problems hypothesis
- **Analysis of Cued RTA Data:**
 - Used as support to the previous analysis
- **Analysis of Eye-Tracking Data :**
 - Gazeplots and Gaze Replays
 - Eye-Tracking Metrics
- **Analysis of Questionnaires Data:**
 - Users' perception of platform usability
 - Users overall satisfaction in executing the tasks requested

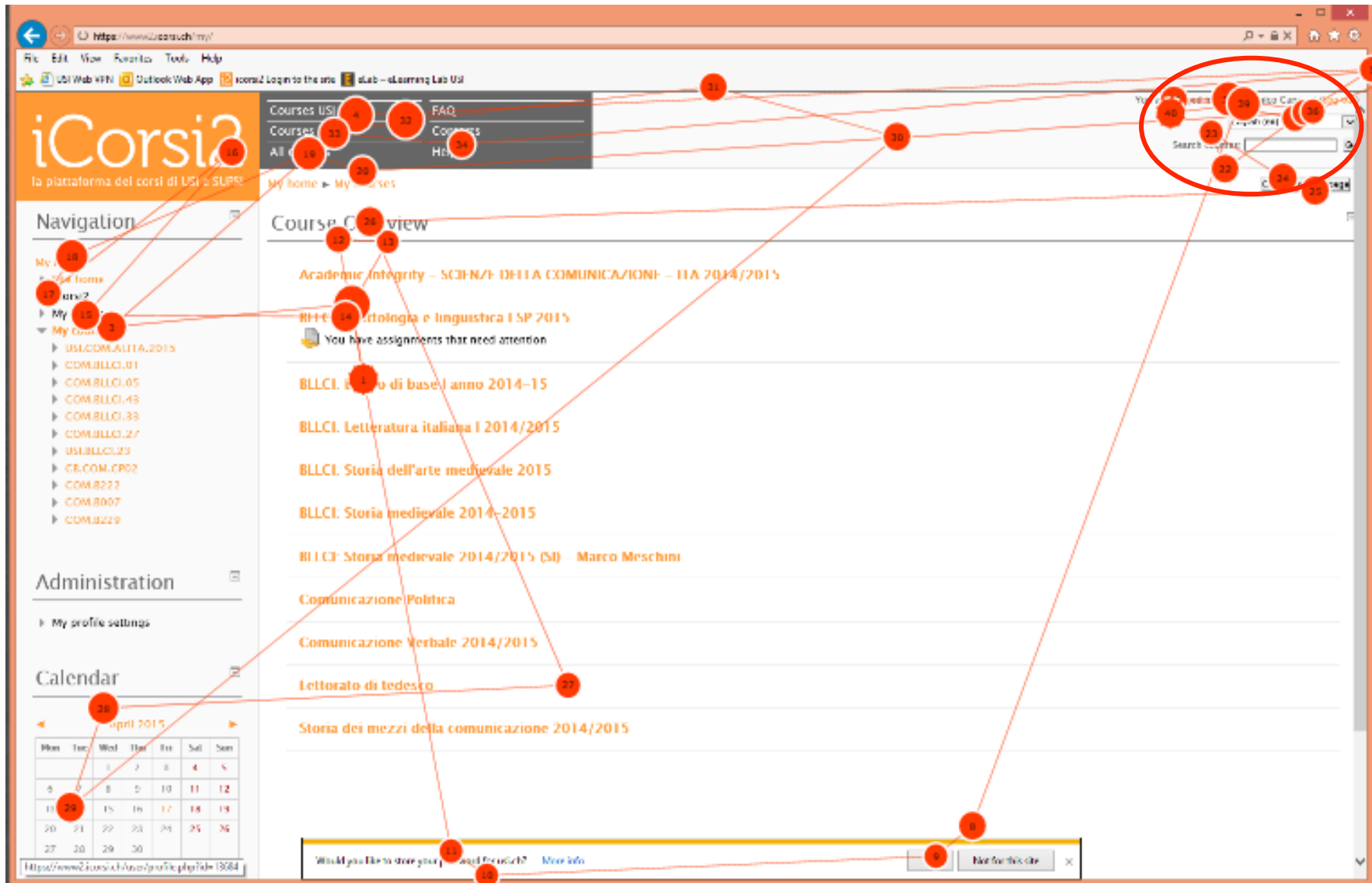
RESULTS AND DISCUSSION

iCorsi2 Usability Issues

The analysis revealed **eight major factors** influencing the usability of iCorsi2:

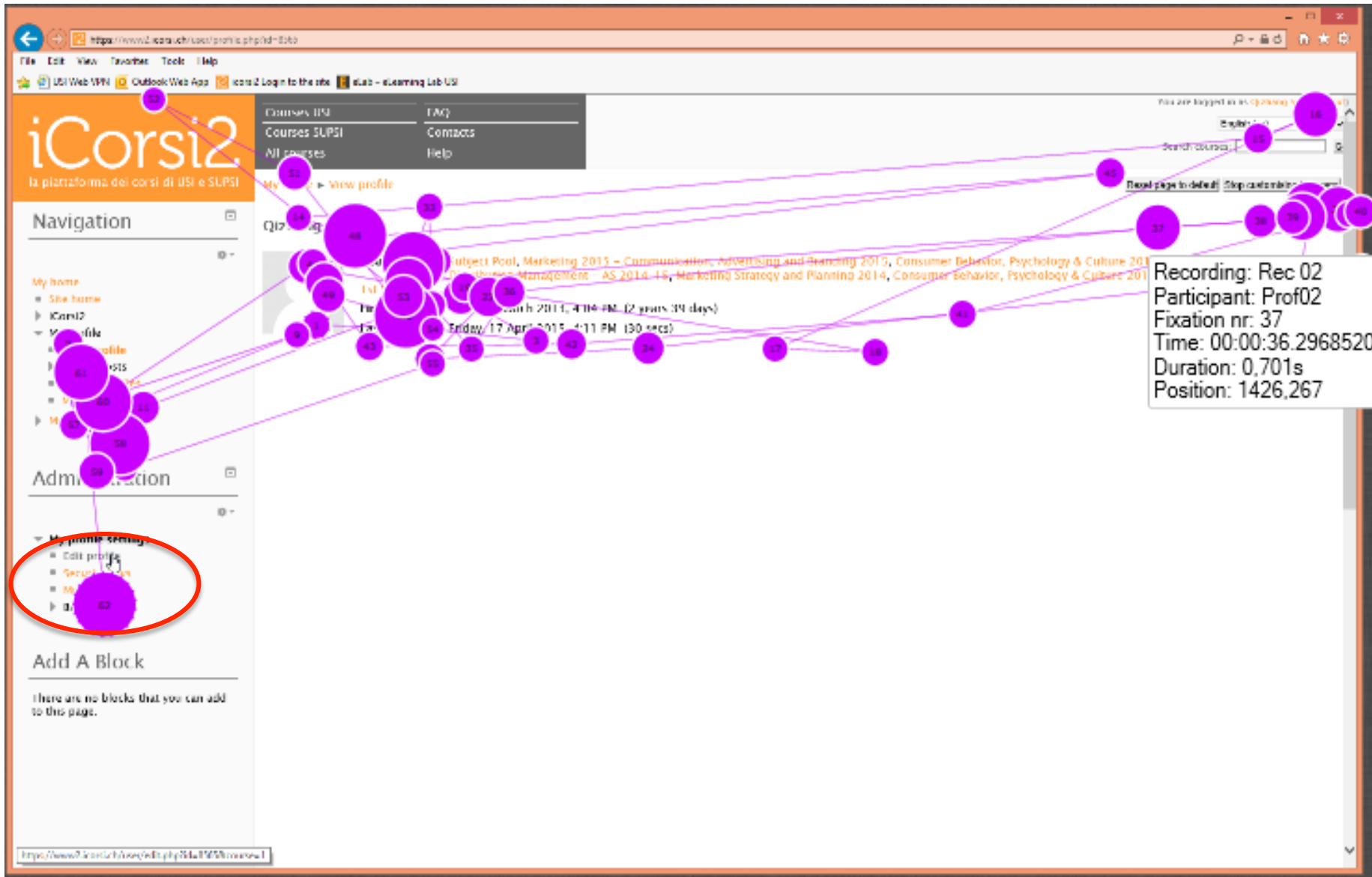
- 1) **Scarce visibility** of some links
- 2) **Wrong placement** of some links
- 3) Violation of the **principle of closeness**
- 4) Violation of the **principle of selective attention**
- 5) **Lack of physical consistency** of the platform elements
- 6) **Bad information architecture** in terms of **clarity of the link labels**
- 7) **Bad information architecture** in terms of **organization of information**
- 8) **Scarce visibility** and **low functionality** of the **breadcrumb** bar

Example: Task 1 → Open your Profile



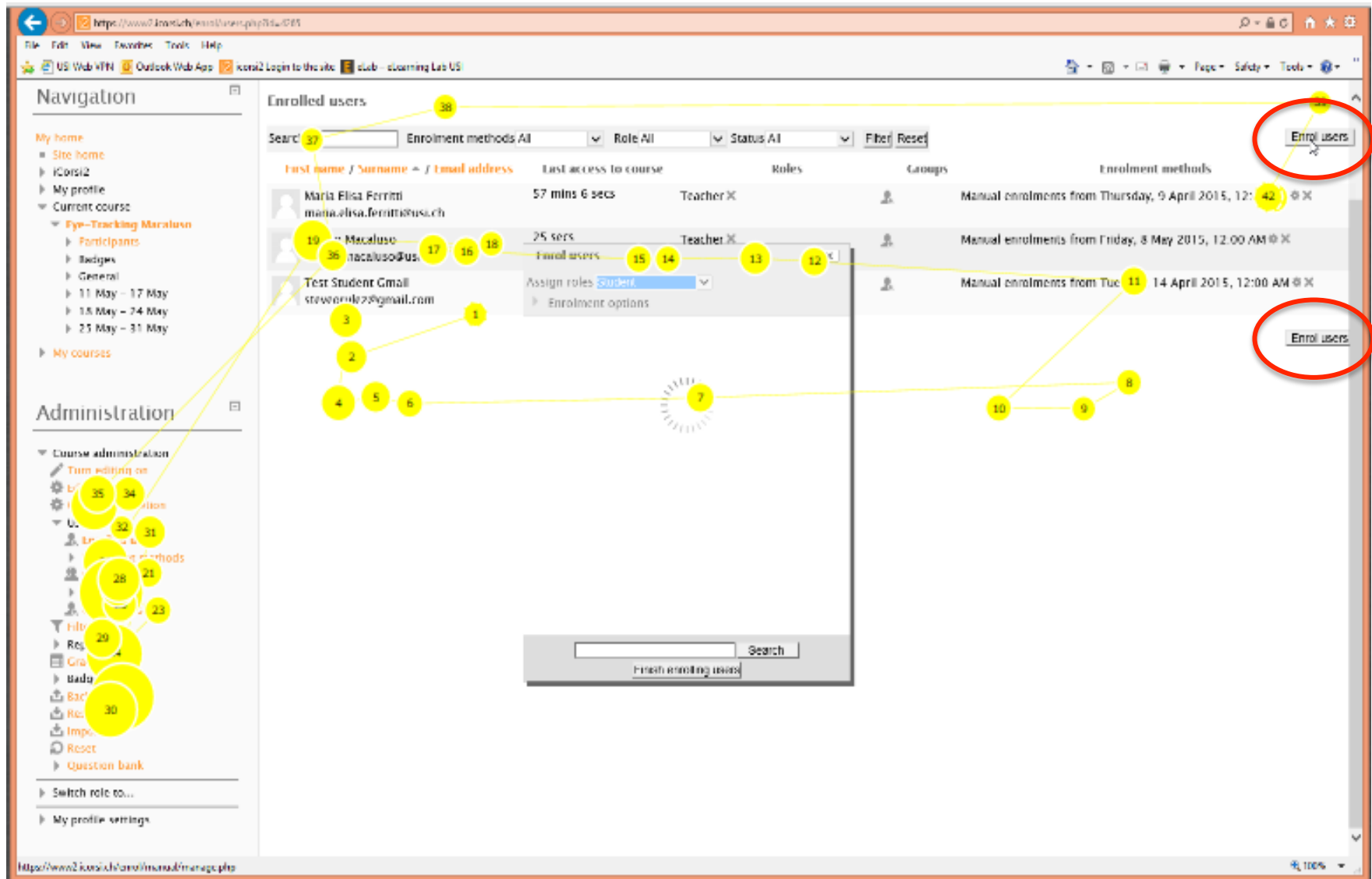
Task1 - S02 Gazeplot

Example: Task 1 → Modify your Profile



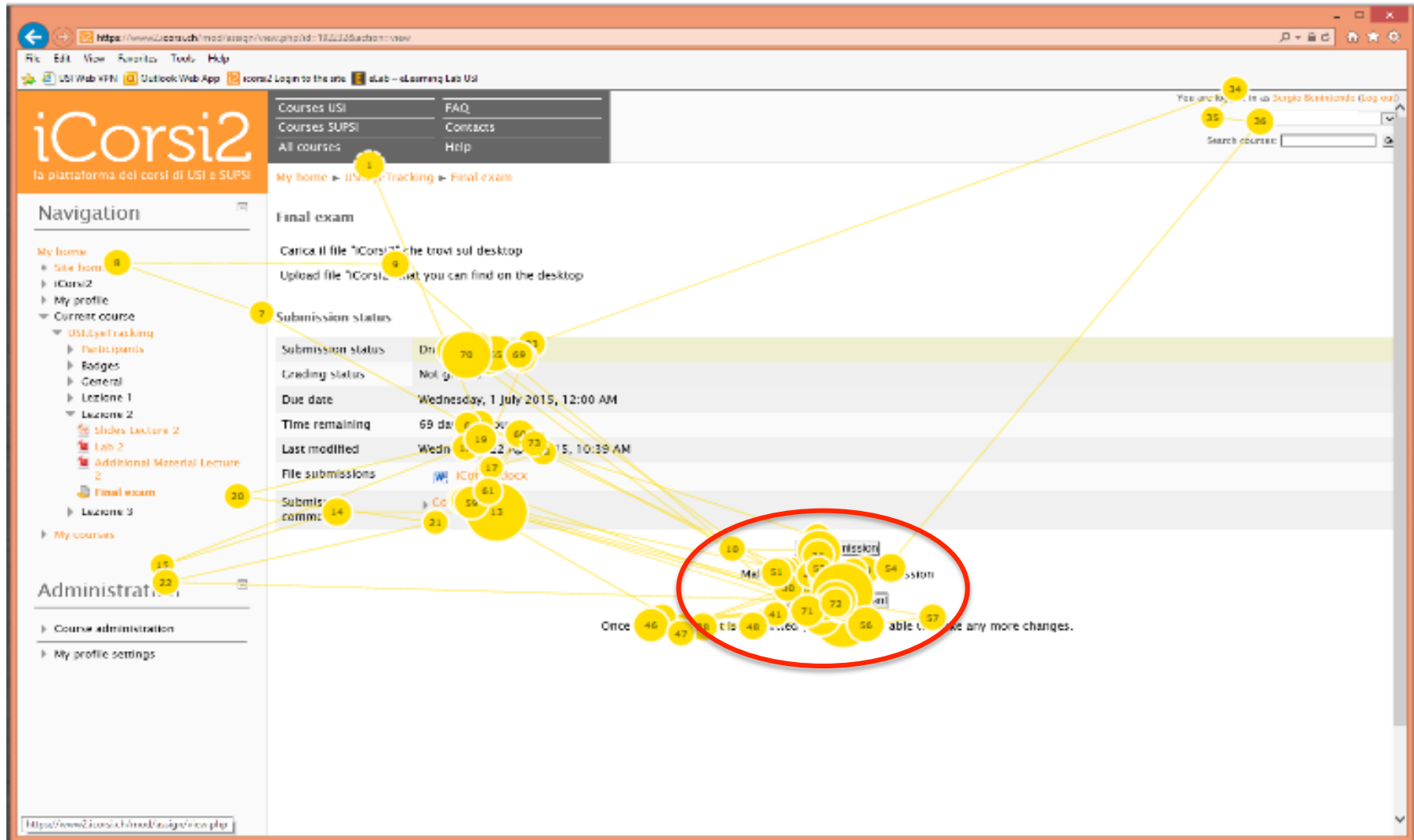
Task1 - P02 Gazeplot

Example: Teachers' Task 4 → Users Enrolment



Task4 - P14 Gazeplot

Example: Students' Task 2 → Submit Assignment



Task2 - S07 Gazeplot

Users' Perception

Post-Test Questionnaire Analysis:

- Participants showed a positive attitude towards the platform and its usability
- Participants were satisfied of how they have accomplished the test

The analysis revealed **DISCREPANCIES** between subjective evaluation and objective data

Users' appreciation of
the platform usability

VS

Users' real performance
during the Eye-Tracking test

Users' real performance
during the Eye-Tracking test

VS

Users' satisfaction of their
performance after the test



Users' perception not always correspond to the real degree of usability of a system

Guidelines for usability improvements

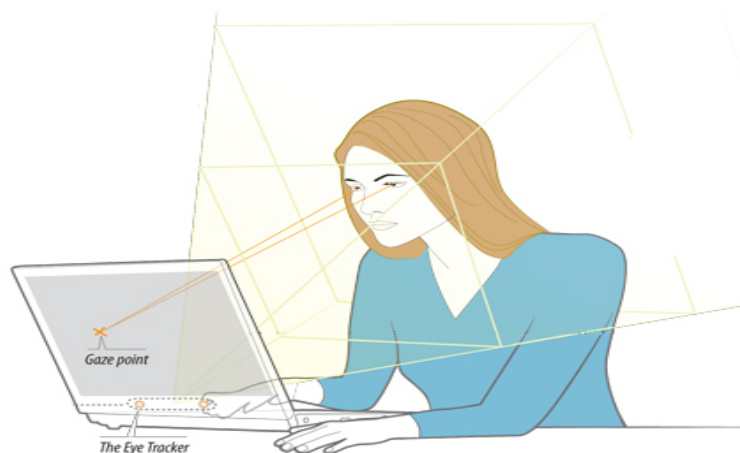
- 1) **Respect the principle of closeness** by placing related elements near each other
- 2) **Respect the principle of selective attention**, placing related elements inside users visual focus
- 3) **Design a third navigation column**, placed on the right hand side of the page
- 4) **Enhance the platform information architecture**
- 5) **Improve the physical consistency** of all the platform elements
- 6) **Make the important links well visible**, using gloss or hints
- 7) **Improve the breadcrumb bar design**
- 8) **Display on the platform homepage the profile picture** of the user

**THANK YOU
FOR YOUR ATTENTION**

Eye-Tracking

Eye-Tracking is a technique that:

- allows to **track the eye movements** of an individual while observing a certain stimulus
- measures the **point of gaze** of an individual through the “**Corneal-Reflection**” method
- identifies **where a person is looking at** in any given time and the **sequence in which his/her eyes shifted** from one point to another;
- allows to be aware of **where users focus their attention** and which kind of **information they process**.



Why using Eye-Tracking in usability research?

Eye-Tracking:

- allows to **assume the perspective of the users**;
- allows to **investigate users' mind processes, visual attention and information processing**;
- gives concrete evidences on **how users interact** with the system;
- gives to usability research more **reliability** and **objectivity**.

Usability of an eLearning System

Usability → *“The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context” (ISO-9241).*

eLearning systems place a **key role in education** as they can **affect the learning process**.

The easier to use is the eLearning system, the faster and the better students will be able to focus on contents and activities (Rosato et Al., 2007).



Learning Management Systems should:

- be provided with **intuitive** and **easy to use interface** design;
- allow **easy** and **satisfactory** users' **interaction** and **navigation**.

“Usability is a necessary condition for an efficient, effective and satisfactory online learning experience” (Triacca et Al., 2004).

Results Post-Test Section 1

	Students Mean	Teachers Mean
Q1	4,7	4,8
Q2	2,9	3,5
Q2 (inverted scale)	5,1	4,5
Q3	1,8	2,7

Results Post-Test Section 2

	Students Mean	Teachers Mean
Q4	5,7	4,7
Q5	5,3	4,8
Q6	6,2	4,8
Q7	3,9	4,9
Q7 (inverted scale)	4,1	3,1
Q8	2,6	3,8
Q8 (inverted scale)	5,4	4,2

Section 1

Q1. Overall, I am satisfied with how easy is to use this platform

Q2. I find this platform very complex to use

Q3. When I encounter some difficulties, I usually utilize the platform "Help" or "Faq" sections and I find them very useful

Section 2

Q4. I am satisfied with how easy was to accomplish the tasks

Q5. I am satisfied with the amount of time needed to accomplish the tasks

Q6. I have successfully complete all the tasks

Q7. I had some troubles in completing one or more tasks

Q8. I felt occasionally frustrated while trying to accomplish the tasks

POST-TEST STUDENTS

Q1. Overall, I am satisfied with how easy is to use this platform

Q2. I find this platform very complex to use

Q3. When I encounter some difficulties, I usually utilize the platform "Help" or "Faq" sections and I find them very useful

	Q1	Q2	Q2 (Inverted scale)	Q3
S02	3	5	3	6
S03	4	5	3	1
S05	2	5	3	1
S06	6	1	7	1
S07	7	1	7	2
S08	7	1	7	1
S09	3	6	2	2
S10	5	2	6	2
S11	5	1	7	1
S13	5	2	6	1
Mean	4,7	2,9	5,1	1,8
Stdev	1,702938637	2,078995484	2,078995484	1,549193338

	Q4	Q5	Q6	Q7	Q7 (Inverted scale)	Q8	Q8 (Inverted scale)
S02	4	4	7	5	3	3	5
S03	5	5	3	6	2	5	3
S05	6	4	6	6	2	6	2
S06	6	6	7	2	6	1	7
S07	7	7	7	2	6	2	6
S08	7	7	7	1	7	1	7
S09	5	4	5	4	4	2	6
S10	5	5	6	6	2	1	7
S11	6	6	7	3	5	1	7
S13	6	5	7	4	4	4	4
MEAN	5,7	5,3	6,2	3,9	4,1	2,6	5,4
STDEV	0,948683 2	1,159501 8	1,316561 1	1,852925 6	1,8529256	1,837873 1	1,8378731

Q4. I am satisfied with how easy was to accomplish the tasks

Q5. I am satisfied with the amount of time needed to accomplish the tasks

Q6. I have successfully complete all the tasks

Q7. I had some troubles in completing one or more tasks

Q8. I felt occasionally frustrated while trying to accomplish the tasks

POST-TEST TEACHERS

Q1. Overall, I am satisfied with how easy is to use this platform

Q2. I find this platform very complex to use

Q3. When I encounter some difficulties, I usually utilize the platform "Help" or "Faq" sections and I find them very useful

	Q1	Q2	Q2 (Inverted scale)	Q3
P02	4	6	2	2
P06	5	4	4	1
P07	3	5	3	3
P08	7	1	7	6
P09	2	6	2	4
P10	6	3	5	1
P11	5	3	5	1
P13	5	3	5	5
P14	5	2	6	1
P15	6	2	6	3
Mean	4,8	3,5	4,5	2,7
Stdev	1.475729575	1.715938357	1.715938357	1.82878223

	Q4	Q5	Q6	Q7	Q7 (Inverted scale)	Q8	Q8 (Inverted scale)
P02	5	5	5	5	3	5	3
P06	3	3	5	5	3	2	6
P07	5	5	3	5	3	3	5
P08	7	7	7	3	5	1	7
P09	2	3	2	6	2	6	2
P10	7	7	7	1	7	5	3
P11	5	3	5	7	1	5	3
P13	6	6	6	4	4	2	6
P14	2	2	3	6	2	5	3
P15	5	7	5	7	1	4	4
Mean	4,7	4,8	4,8	4,9	3,1	3,8	4,2
Stdev	1.8287	1.93218	1.68654	1.85292	1.85292	1.686548	1.686548

Q4. I am satisfied with how easy was to accomplish the tasks

Q5. I am satisfied with the amount of time needed to accomplish the tasks

Q6. I have successfully complete all the tasks

Q7. I had some troubles in completing one or more tasks

Q8. I felt occasionally frustrated while trying to accomplish the tasks