

LIFE LONG LEARNING PROGRAMME

TRANSVERSAL PROGRAMME

KA3 – ICT-Multilateral projects



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2 DISCLAIMER

This project has been funded with support from the European Commission. This publication (communication) reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

3 ACKNOWLEDGEMENT

This document, deliverable D3.1 “TASTE users scenarios”, reports the developed activities and obtained results from the work package 3 “Design of TASTE users scenarios”. It has been prepared by COREP and IVB with the contribution received by all partners under the coordination of IVB.

4 EXECUTIVE SUMMARY

The TASTE system is foreseen for specific target groups of users that include technicians, doctors (specialists and residents) and students in the field of Anatomic Pathology.

This ICT environment providing high level training system on histopathological and cytological techniques needs to be set up according to the specific needs and expectations of the target users: this aspects have been investigated in workpackage 2 “Refinement of Needs Analysis”.

Results of the investigation brought several inputs for the design of TASTE usage scenarios, which final definition is the aim of the workpackage 3 “Design of TASTE users scenarios” and is reported in the present document.

This report starts with an overview of the different **target users** and therefore related needed permission requirements.

A second part focus on the design of the TASTE **content organization**, exploiting steps and different decisions taken by the partnership in this first period of the project and the final result achieved after considering the feedback from deliverable D2.1 [1].

Finally **scenarios** for the different users categories approved by the TASTE consortium are reported: on the basis of these scenarios, functionalities required to the TASTE system will be defined in D3.2 “Specifications for development of TASTE system” [2].

The development of the TASTE system was anticipated by the partnership so also the validation of scenarios have been done in “practice” showing to several users (189) the different possibilities. The system is available at <http://www.system.tasteproject.eu> [3].

5 INTRODUCTION

The involvement of IT in applied research and in the development of medicine improves diagnostic and as an obvious consequence, therapy and could possibly reduce complexity or adverse results of health care. The change in teaching and learning is constantly developing, as global technology and the degree of qualification needed change, thus enabling more focused pedagogical knowledge to occur.

The lack of a standardized quality in the histological and cytological preparations is a direct consequence of a missing knowledge sharing among technicians and doctors conducting pathological diagnoses.

A number of questions are certainly important in everyday practice of every pathology departments and there is an increasing demand for the answers in the era of digital pathology characterized with open circulation of virtual slides (Fig. 1) throughout many countries of the world. This project wants to tackle important subjects as defining a top quality histological-cytological section, and more important what is an internationally accepted standard level of section or staining quality, which technical artefacts are considered as not acceptable in a slide of standard quality, while there still can be acceptable technical quality with no impact on diagnostic assessment. At the end of all, an improved awareness of possible pitfalls in the creation of histological and cytological preparations (and therefore a continuous learning process being available for users), will led doctors and technicians to raise the quality of the slides and avoid artefacts, thus allowing more accurate diagnoses.

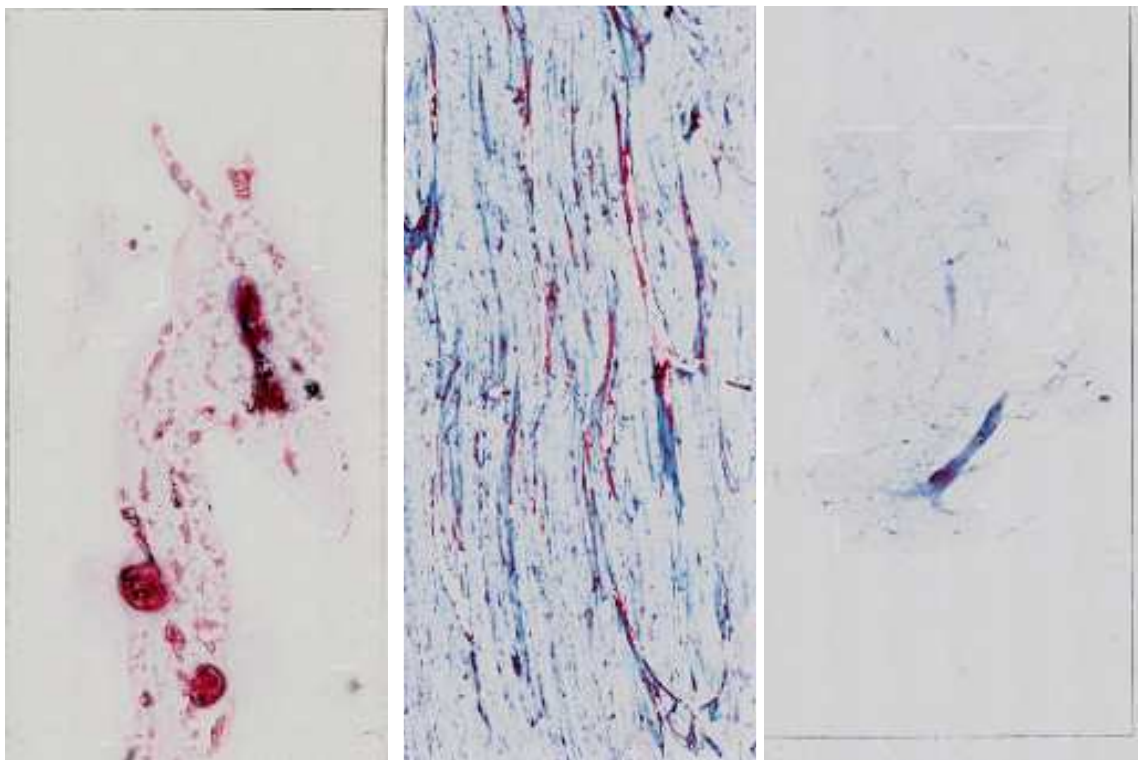


Fig. 1: Examples of virtual slides

The Project (www.tasteproject.eu) faces these problems by building-up an ICT environment “TASTE System” whereby pathologists, technicians and students will consult and/or train themselves on a repository of microscopic images and related best/worst cases related to histological and cytological preparations. The building of the images database will start from TASTE consortium countries (Italy, Romania, Portugal, Belgium and Sweden), but hopefully, this process, open to the public, will collect and raise samples and cases from all over the world.

In fact, it is expected that TASTE users will contribute to enlarge the knowledge sharing repository uploading in the system, via the World Wide Web using TASTE tele-pathology procedures featuring “virtual slides”, their own preparations to a panel of internationally-recognized experts who will “approve” the quality of the slide/case and give them comments and suggestions.

An investigation for the refinement of needs analysis and, consequently, for the definition of TASTE usage scenarios has been conducted in workpackage 2 [1]. An extensive assessment with real users in the final part of the project will allow to smooth-down the major problems encountered both from a technical then scientific qualitative point of view (Fig.2).

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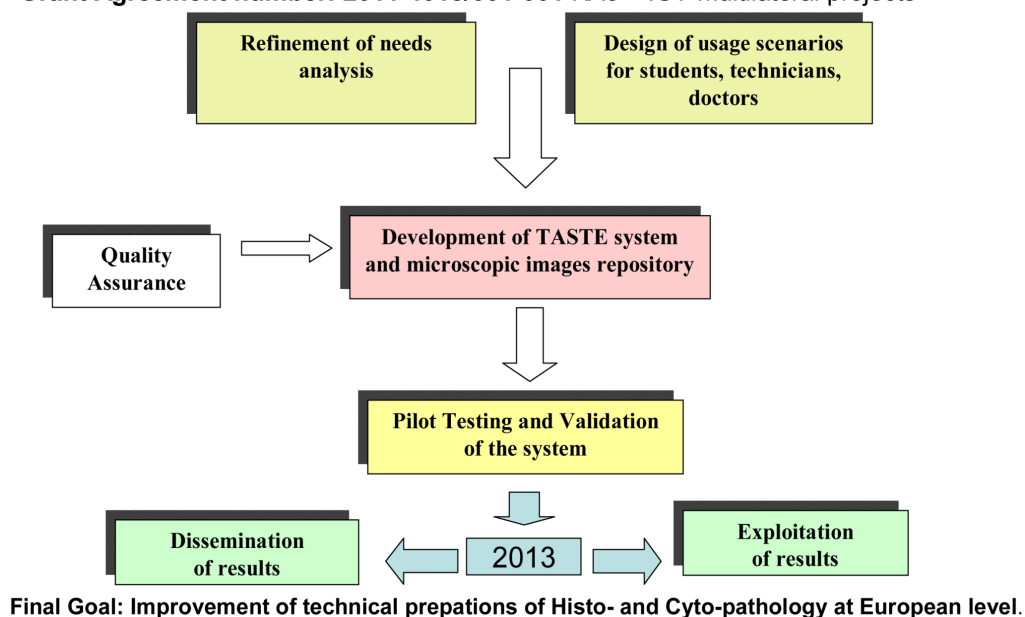


Fig.2 – The TASTE project logical approach

Activities related to work-package 3 led to the identification of **proper user scenarios** to be applied to the different categories belonging to the TASTE primary target groups - **professionals** (technicians, biologists, medical doctors, residents and specialists in anatomic pathology) and **students** (future professionals) - considering the different needs of target users and their interaction, given the fact that they will all access a common framework of applications.

The introduction of a highly accessible e-learning system required an accurate identification of target groups needs and expectations, as the platform will be considered useful only if the people it is addressed to are using it.

As a leading partner in workpackage 3, IVB started studying the structure of the Romanian society by talking to both students and fellow pathologists, as well as technicians, and further on, they investigated the Internet in appreciating the European level of interest in matters of standardized quality in the histological and cytological preparations. There are trends in the interest people have for pathology at the beginning of their carriers, but also different approaches in specialists came out. Variations in user population are expected in relation to the understanding and will to use the e-learning system.

Several scenarios have then been created, based also on different functionalities. Because of the characteristic of our expected users, the TASTE partnership decided to anticipate the development of the system and of the microscopic image repository, so that discussions and feedbacks received by users related to the their real needs and expectations (very useful to define their usage scenarios) in the context of workpackage 2 activities, led to a concrete perception of the features the TASTE system could offer.

As a final goal we intend to design the most appropriate TASTE user's scenarios. Scenarios have to share a common feature – an effective eLearning strategy in the form of template. The aim of the present activity was to analyze the methodological possibilities of creating a logic, interactive and easy to use platform for e-teaching in pathology.

6 TASTE TARGET USERS

The target group for the TASTE project is a heterogeneous one, because it includes several groups of people based on the level of education. Age was not taken into consideration even if it is acknowledged the possibility of an existing deficiency in the computer and internet skills, reflected in their ICT competences, of some elder participants.

The project is designed to bring together a heterogeneous group of people with interest in Pathology, ranging from students to international recognised experts, in order to provide access to knowledge and support improvements in quality of work.

Target groups can be divided in:

- A **primary target group**, that is composed by the main users of the system, reached in short term already during the project: these are technicians, doctors and students in anatomic pathology;
- A **secondary target group**, composed by bodies/companies where experts in anatomic pathology are present and could benefit of the TASTE system.

In the following chapters, the two different categories are explicated.

6.1 Primary target users

Primary target users of TASTE system can be divided in 5 categories:

1. **Technicians** having an important role in the laboratory in generating precise and accurate pathology test results. They are involved in one of the first lines of diagnostic by working closely with the pathologist, processing the tissues biopsies removed during surgery and producing microscopic stained slides that will be viewed under microscope by pathologists. They have advanced training in how and why specimens are collected and processed for testing. By examining the slides, the pathologist enunciates a diagnosis that will be further used to decide the best course of treatment for the patient. The quality of the slide is reflected on the diagnostic.
2. **Doctors** (medical doctors, residents and specialists in Anatomic Pathology) examine histological and cytological specimens and formulate a diagnosis. The detection of errors in the technique behind every slide is critical to quality improvement, this is why all specialists should be able to determine the quality of a slide and where a mistake was done in the technique.
3. **Biologists** were added as a separate group because there will be limited interest in the histopathology cases, but an expected high one in the cytology area. In some countries (e.g. in Romania), biologists represent the first line in screening for malignancies. The application of this new methodology in training in cytology may help in optimizing the quality of samples available for reporting. The modifications existent in a cytological specimen can be subtle (discrete nuclear and cytoplasmic changes) and a correct analysis of these microscopical cellular changes directly affects a patient's course of treatment by early detection of cancer, therefore a good quality specimen is needed in order to confirm the presence of malignant cells in a tissue.

- 4.-5.**Students** (both student future technicians and doctor) who represent the raw material, the people who might one day turn into technicians in Pathology or doctors. It is important for them to be familiar with what good quality means in histological and cytological terms. Cases included for these categories will be easier and at a beginners level, but they will have the possibility to view cases and do exercises provided for their potential "future"(technicians or doctors) in case they manifest a real interest.

6.2 Secondary target users

Secondary target groups include:

- hospitals
- universities
- associations of professionals
- National Health Services
- companies working in the area of Pathology

Long term envisaged beneficiaries are experts and professionals working in Pathology Departments on histo-pathological and cyto-pathological techniques, universities benefitting of innovated ICT system like TASTE for training students, national services where knowledge sharing will allow a higher and standardized quality of preparations to be reached.

All these group of users will be mainly reached through the ESP (European Society of Pathology).

6.3 Users permissions

The TASTE system should provide different kind of permissions:

- **Normal user:** technician, biologist, doctor, student normally using the system, accessing images repository, doing exercises, interacting with forum and chat; it is the lower privilege, can use only the services enabled by higher levels.
- **Trainer:** a professional, recognized and authorised by the TASTE panel of experts, who can upload images, educational material, creating discussion forum, give permissions to normal users; can organize and manage a course (a branch in system.tasteproject.eu)
- **TASTE Administrator:** can manage the entire TASTE system, creating new areas of contents, etc.

7 TASTE CONTENT ORGANIZATION

The TASTE project aim is the development of a tele-pathology training system on histo-pathological and cyto-pathological techniques through the use of modern ICT systems, including an e-learning platform, a virtual microscope and a repository of microscopic images and slides.

An explanatory more detailed context analysis has been already presented in D2.1 Refinement of needs analysis [1].

To give an introductory overview, in the following a short explanation of the difference between Histopathology and Cytopathology, branches of Anatomic Pathology, is given.

7.1 Histopathology and Cytopathology

Histopathology refers to the microscopic examination of tissue in order to study and detect the pattern of disease. Specifically, in clinical medicine, histopathology refers to the examination of a biopsy or surgical specimen by a pathologist, after the specimen has been processed and tissue sections have been placed onto glass slides. [4].

Cytopathology is a branch of pathology that studies and diagnoses diseases on the cellular level. A common application of cytopathology is the Papanicolaou test (PAP test), used as a screening tool, to detect precancerous cervical lesions and prevent cervical cancer. Cytopathology is commonly used to aid in the diagnosis of cancer, but also helps in the diagnosis of certain infectious diseases and other inflammatory conditions. Cytopathology is generally used on samples of free cells or tissue fragments, in contrast to histopathology, which studies whole tissues. [5].

Specimen preparation for histopathology and cytopathology requires different artificial procedures, but the final result is to obtain preparation as close as possible to the living state.

The goal is therefore to avoid artefacts, which can derive from different factors (techniques not properly applied, surgical procedure, poor tissue preparation, etc.). **Artefacts can compromise accurate diagnosis, for that reason it is very important for pathologists to recognize and understand them.**

So, the idea at the basis of the project is exactly this one: showing to professionals and students examples of good and bad cases-microscopic images related to different organs/samples- treated with different processes, so that working pathologists and future ones can improve their knowledge about these possible pitfalls and consequently raise the quality of their slides.

The goal will be achieved by collecting top quality, average quality and preparations damaged by artefacts and archiving them in a digital web-based archive. The images will thereafter be standardized through user assessment sessions and made available for the interested professionals all over the world.

7.2 Approach

The educational potential of the ICT, will bring a series of advantages:

- participants can be geographically dispersed
- there is access to learning opportunities and formation of communities despite different societies
- language barriers will be broken by the use of both the languages of all the countries of the project partners as well as the use of English
- they can study in any place at any time
- the TASTE system is thought mainly as an interactive problem-solving system of teaching by providing a series of cases and exercises

We also took into consideration Several risk factors related to all types of e-learning system are of course to be taken into consideration:

- - the need to have a computer and internet access
- - self-motivation of the participants for e-learning

The platform will use several systems for training. Everything will be based on self directed and active learning, blending and adapting them to the platform framework as well as to the needs of target group. There is a need for flexibility in order to be able to follow the pathways indicated by the trainers. One of the main goals of creating user scenarios was identification of methods that are suitable for training in quality assessment of histological and cytological techniques and selection by the trainers of those that meet the needs of the target group.

The improvement of histo-pathological and cyto-pathological preparations at European level, which is the goal of the TASTE project, must recognize definite landmarks, since one should acknowledge that no preparation can properly be defined as "perfect". The Project is accordingly pursuing the goal of an "**acceptable level**", i.e. of preparations permitting sound and reproducible diagnoses.

Tests/examples of artifacts preventing correct diagnoses will constitute the basis of the cases/exercises.

Several aspects will be followed when formulating the cases/exercises:

- several levels of complexity
- different types of cases/exercises
- different approaches to the same problem

Another important aspect was brought into discussion during the creation of the different scenarios. Differences between real image and virtual image and online implementation have to be taken in consideration, and issues to consider during implementation with real users. Fixed images have been introduced to facilitate the answer to questions, but with link to the "true" slide, to be seen on the virtual microscope.

Since exercises are intended to improve knowledge about techniques in histopathology and cytopathology and they are not thought as a time limited test, the target users will not be required to complete all the quizzes at once. Also, there will be no need to perform to a certain standard on them. Another possibility could be the preparation of timed quizzes, with a cutoff value of over 50% of correct answers in order to pass the quiz.

In the development of the scenarios, we created several generic templates that can be adapted to suit any appropriate content area with different functionalities..

7.3 Different steps in the design of content organization

The design of the content organization in the system has passed through different phases during the first year of the project. The TASTE management board, composed mainly by worldwide recognized expert in the field of Anatomic-Pathology, made several discussions about which could be the more appropriate organization to be given to content-and therefore- to the system.

Since the system will be localized in several languages, a **first choice** to the user should be related to the **language** that-at least during the Taste project- could be one of the following (TASTE partners languages):

- English
- French
- Italian
- Portuguese
- Rumanian
- Swedish

This selection should be followed by the **login** of the user. It would be preferable that the user could choose by him/herself his/her login and password, in order to avoid automatic password assigned by the system or by the administrator that the user could not easily remind. The access to the system should in any case be ruled, perhaps with some key-password to be inserted the first time the user log in.

Secondly, since the project should be tailored to the different primary target users, the user should choose one of the following categories:

- ❖ Technicians
- ❖ Biologist (including Cyto-screener)
- ❖ Doctors (including medical doctors, residents, and specialists in pathology)
- ❖ Students

A **further** fundamental **step** is related to the different branch of interest of the Anatomy.Pathology, that is

- Histo-Pathology
- Cyto-Pathology.

It should be specified that artefacts in cytopathology and histopathology have different origin and potential effect. For these reasons, it is rational to keep them separate.

The fourth and last selection was debated: initially it has been thought to group artefacts according to the kind of origin tissue/organ, for example breast, lump, cervix, etc. This organization was abandoned after some months because the partnership –through discussions with external potential

users made during dissemination activities, the TASTE public workshop and the needs analysis investigation- realized that the it was better to group artefacts not by organ/tissue but according to the process involved in the considered case. This is also to avoid that artefacts of a same kind of sample but originated from different procedures are mixed.

Therefore the **fourth** selection has been made on the kind of **procedure**.

The **first designed full sequence** of selections from the TASTE platform was:

Language/User Category/ Histo-Pathology or Cyto-Pathology/Procedure

It has already been said that the TASTE consortium anticipated the development of the system. This allowed both the TASTE partners and real users to already try to use the system with the designed content organization and raise up some considerations (see details in [1]):

- Best/worst cases should be presented as quizzes of various kind, to enforce a constructivist learning methodology
- Same images can be used for quizzes but also to enrich the TASTE Encyclopaedia of histological and cytological images
- Thumbnails of microscopic images should be shown (not only their link to the virtual microscope)
- Users should have the possibility to ask for feedback and eventually upload their own images
- Some best/worst cases initially thought for a specific user category, could, in reality, be of interest also for other categories, looking at them from a different point of view.

7.4 The final TASTE content organization

Following the above observations, some changes in the organization, resulting in specifications for the development, have been agreed:

1. There is no sense in inserting the division of the user categories: since most exercises could be of interest of different users, the division will be avoided but at the beginning of each procedure section (e.g. fixation, smearing,...) indication about **which cases are suggested for each user categories will be given**.
2. **Thumbnails** (small fixed images) of microscopic images should be inserted to give to reader an “idea” of the image he/she is going to see.
3. Collected images will be used for different kind of quizzes (experiential learning approach/ self- assessment) but also for the creation of an “**Encyclopaedia of histopathological and cytopathological preparations**” that will be a collection of images, pdf file, and other possible training material.
4. Users could upload their own cases to ask for a feedback or to share their experience. The system should also be designed in order to foresee the creation, upon request, of **separated “dedicated” repository** for single universities/hospitals/associations that would like to have their own restricted access area where they can circulate their images within colleagues.




Regarding the chance of uploading the images directly by users, the TASTE partnership agreed it has to be acknowledged by a **quality supervision** by a panel of experts.

The final content organization for the TASTE system should then be accessed through the following choices: **LANGUAGE / HISTO-PATHOLOGY OR CYTO-PATHOLOGY/PROCEDURES.**

A stepwise approach for the assessment (and hopefully the improvement) of the various histopathological and cytopathological preparations will be conducted, so that the exchange of images will start with basic routine stains (Haematoxylin-Eosin stained slides, Papanicolaou-stained smears) in order to check quality and reproducibility of fixation, processing and staining procedures. The 3 years program should then proceed with more sophisticated techniques such as special stains and immunohistochemical preparations.

The foreseen **categorization of Histo-Pathology or Cyto-Pathology** is:

CYTOPATHOLOGY

-  GYNECOLOGICAL CYTOLOGY
 - Fixation
 - Contamination
 - Smearing
 - Staining
 - Dehydration post-staining
 - Mounting
 - Presence of foreign elements
-  EXFOLIATIVE NON-GYNECOLOGICAL CYTOLOGY
 - Fixation
 - Contamination
 - Smearing
 - Staining
 - Dehydration post-staining
 - Mounting
 - Presence of foreign elements
-  FNA (FINE NEEDLE ASPIRATION) CYTOLOGY
 - Fixation
 - Contamination
 - Smearing
 - Staining
 - Dehydration post-staining
 - Mounting
 - Presence of foreign elements

HISTOPATHOLOGY

- Prefixation handling
- Fixation
- Processing and Embedding
- Sectioning
- Staining: H&E
- Staining: Special stains
- Staining: Immunohistochemistry
- Mounting
- Presence of contaminants

These categories could of course be expanded or could be fine tuned according to results of the future extensive assessment phase of the project.

A diagram showing the TASTE content organization is shown in figure 2.

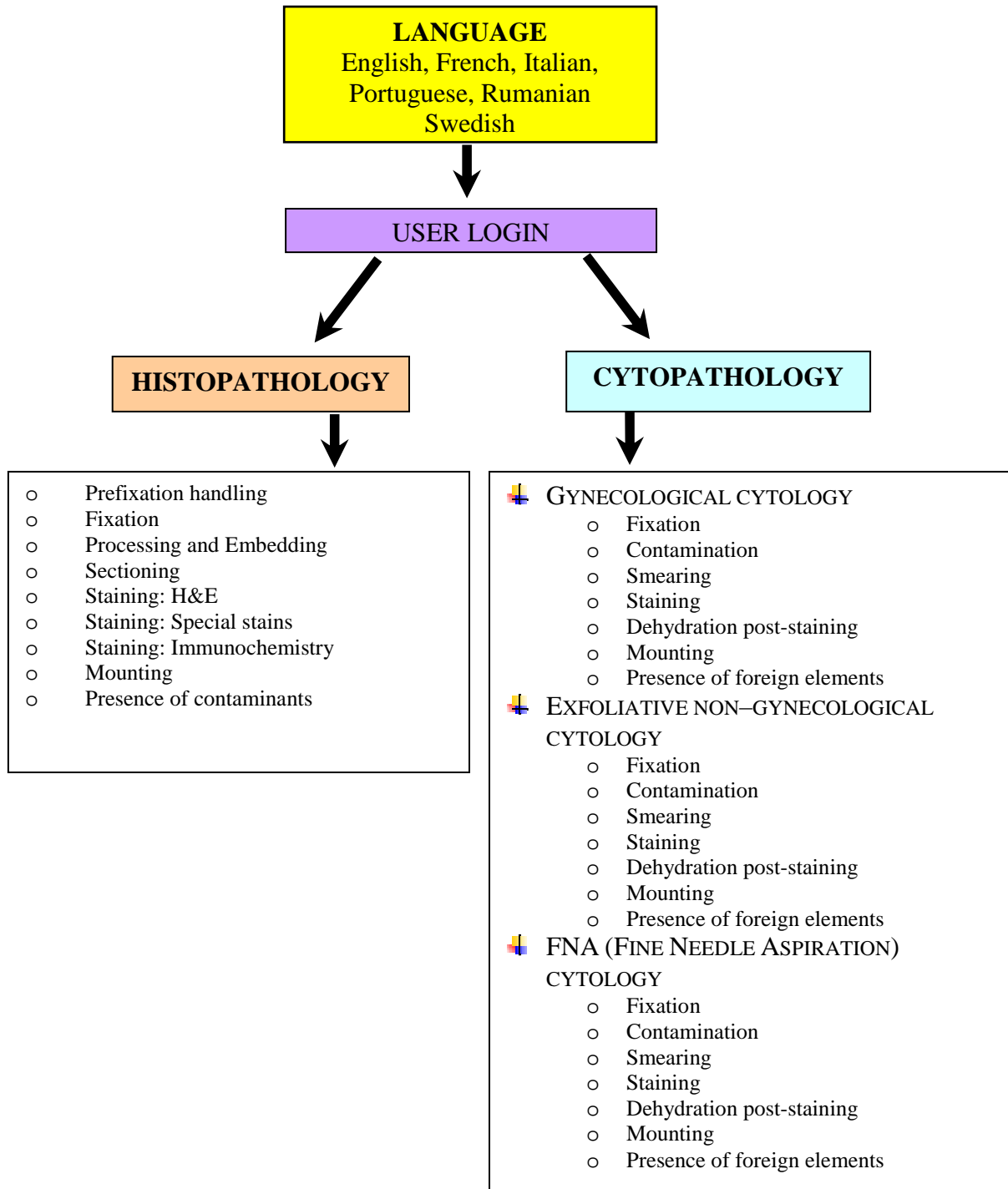


Fig.2: Taste content organization

8 TASTE USER PRELIMINARY SCENARIOS

One of the aims of the TASTE project is the identification of **TASTE usage scenario** for each kind of user, both for training and VET purposes then to join a virtual community where comparing preparations/diagnosis assessed by experts. The partners of the project, both scientific then pedagogical experts, have identified possible scenarios, here below described.

8.1 Scenarios for Professionals

8.1.1 Scenarios for Technicians/Biologists

Technicians will use the TASTE system focusing on the technical quality of the preparations and on methodological issues.

The following different scenarios for training, learning, consulting and sharing experience for the technician category are shown:

1. A technician **shares his/her own experience** with troubleshooting with the Taste community
2. A technician **asks questions about troubleshooting** and the artefacts nature
3. A technician consults the **FAQ** (Frequently Asked Questions) section
4. A technician wants to **identify artefacts similar to his/her own** among the images in the **Library** (Taste Image database)
5. A technician wants to **find an explanation for an identified artefact** in the **Encyclopaedia**, where specimen history is shown
6. A technician **consults an expert** in order to avoid artefacts in the different procedures (staining, mounting, sectioning,...) and use of reagents
7. A lead technician or a trainer **creates case collections** to train and test students and/or members of his staff (available also for Taste community)
8. A technician **self-assesses** his/her expertise through exercises and re-assesses it after training and learning.

8.1.2 Scenarios for Doctors (medical doctors, residents and specialists in pathology)

Doctors will use the TASTE system focusing on the impact of the technical quality of the preparations on diagnoses.

In this category we include also residents

The following different scenarios for training, learning, consulting and sharing experience for the doctor category are shown:

1. A doctor **shares his/her own experience** with troubleshooting with the Taste community
2. A doctor **asks questions about troubleshooting** and the artefacts nature
3. A doctor consults the **FAQ** (Frequently Asked Questions) section
4. A doctor wants to **identify artefacts similar to the one he/she encountered** among the images in the **Library** (Taste Image database)
5. A doctor wants to **find an explanation for an identified artefact** in the **Encyclopaedia**, where specimen history is shown
6. A doctor **shares his/her own experience** in order to verify how artefacts may affect diagnoses
7. A doctor **creates case collections** to train and test students and/or members of his staff (available also for Taste community)
8. A doctor **self-assesses** his/her expertise through exercises and re-assesses it after training and learning
9. A doctor **verifies** samples of artefacts coming out from a process in order to state the acceptability level of slides delivered by technicians.

8.2 Scenarios for Students

Students will use the TASTE system focusing on the impact of the technical quality of the preparations.

The following different scenarios for the student category, focused on training and learning, are shown:

1. A student **asks questions about troubleshooting** and the artefacts nature
2. A student consults the **FAQ** (Frequently Asked Questions) section
3. A student wants to **identify artefacts similar to the one he/she encountered** among the images in the **Library** (Taste Image database)
4. A student wants to **find an explanation for an identified artefact** in the **Encyclopaedia**, where specimen history is shown
5. A student **self-assesses** his/her expertise through exercises and re-assesses it after training and learning
6. Students are asked by the trainer to comment and make **supervised peer review** about the quality of an image

7. Students are asked to comment on a case collection created by the trainer.
8. A trainer **assesses** students through exercises.

These scenarios are suitable both for student future **technicians** then for students future **pathologists**: the difference, obviously, will be in the educational content (for the technicians focused on the creation process of the slide, for the pathologists in judging the quality of the slides and in giving the correct diagnoses).

9 CONCLUSIONS

Scenarios for all the different kind of categories of primary target users have been defined. These will possible be the most required and used one, but the hope is that the capillary diffusion of the system will let the repository of cases and images grow, and hopefully also further scenario could be developed.

Identified scenarios, but also content organization, have been extensively discussed with real users and they were “changed” a number of time. Recent results from needs analysis investigation confirm that the actual defined setting meets user expectations.

A very encouraging factor is that during all the public presentations of the system (although it is in its beta version) to the real potential users (189 directly interviewed, other ones consulted in informal meetings), approvals and also concrete expressions of interests have risen up, by many parties, technicians, doctors, trainers but also hospitals and companies.

10 REFERENCES

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