

The IniTuX system : A new way to learn GNU/Linux

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Abstract

This document describes an innovative way of learning based on a mix of lectures, practice lab, and simulations with full on-line support. The first experimentation took place at fall 2003 for 180 newly-arrived students beginning their computer science learning. This system builds on concepts already known but not always employed such as self-learning and collaborative work, progress with self-evaluation and distance tutoring.

Introduction : Context, motivations and goals

Based on previous experience in traditional ways of teaching Computer Science , we developed an innovative system mixing web and traditional technologies and using new pedagogical methods.

Before starting the IniTuX project, we made the following observations :

1. Students' skills are very different when they first come to our school, so they don't learn at the same speed. Teachers wish to make the students more pro-active compared to traditional courses where they can be fully passive.
2. Our purpose is to design a way of "learning and practising" at one's own rhythm with a personalized continuous education method.
3. We want to teach them not only concepts but also know-how.

In addition, we want our students to learn how to use a free operating system using free software tools in order to make them familiar with these tools throughout their learning period at INT. The collaborative platform used by the tutors to build the system has been designed as and with free software: it is called Picolibre, a kind of "sourceforge".

Schedule of the course: Organisation and pedagogical choices

The tutors set up this system in collaboration with the TEL¹ team: they designed the full "screenplay" of the course describing the pedagogical activities and mapping them on a calendar. Hopefully the dean of the school arranged it so that each student has a computer (different from the traditional practice lab where they are two students in front of the same computer).

Pedagogical resources of the system

The documentation of this course consists of books, papers and on-line documents as shown in Figure 1. The on-line documentation is a web-based resource ; it is divided into notions and sub-notions, just as in a reference manual. The content is made up of slides, each slide enhanced with comments and illustrations.

A special kind of illustration called an interactive illustration is used relative to every notion that can be shown and handled so that the student can immediately practice. There are two types of such illustrations: the first designed as a sequence of UNIX commands that must be run by students, and the others showing operating system concepts using graphic animation.

MCQ –Multiple Choice Questionnaires– are as usual integrated with automatic correcting. FAQ –Frequently Asked Questions–, as frequently used in computer science, contain all the questions of former years.

¹ TEL: Technology Enhanced Learning



Figure 1: The resources

How to personalise educational support ?

Students have a choice:

- Attend this course alone ;
- Be one of our first year students, and therefore, have access to all online support and tutoring.

In case of the second choice we design a self-evaluation mechanism so that it can be useful to both students and tutors.



Figure 2: The self-evaluation icons

The student is asked to self-evaluate at the end of each notion (Figure 2). He must "click" on the relevant smiley: "not understood | not sure | understood". He can monitor his progress and modify his results as these improve (Figure 3). On the other side ans whenever they want, the tutors can monitor the situation for each student of their group. They can also have a global vision of the group in order to know where the difficult points of the course are located (Figure 3).

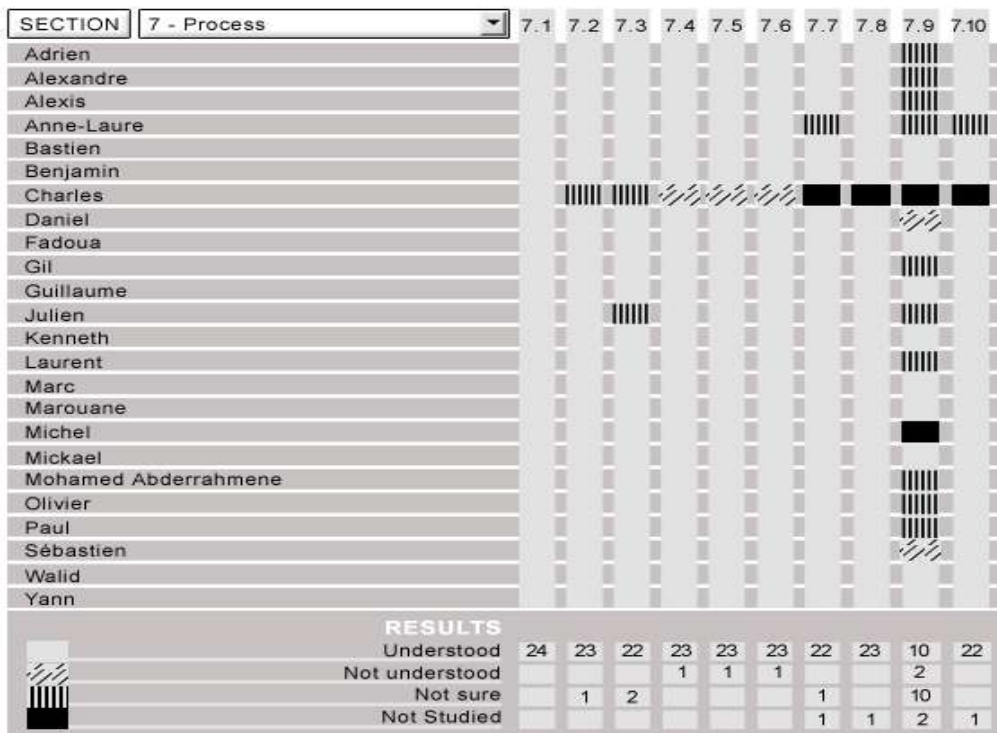


Figure 3: The self-evaluation results

The three lifebelts rule

What can a student do if lost? The "help" icon gives information about "The three lifebelts before May Day" rule as described below:

- First lifebelt: "DOC". Students should have looked at the complete documentation (student book and on-line resources).
- Second lifebelt: "FAQ". Before going further students should have looked at similar questions into the FAQ before asking their tutor ; this is called "using the experiences of former students".
- Third lifebelt: "FORUM". There is one forum per group ; a student can post a question on this forum ; both students and tutors may answer.
- Finally "May day". This is allowed when none of the three lifebelts gives a satisfactory answer: the student may send an email to his tutor, or go and see him in his office.

The course schedule

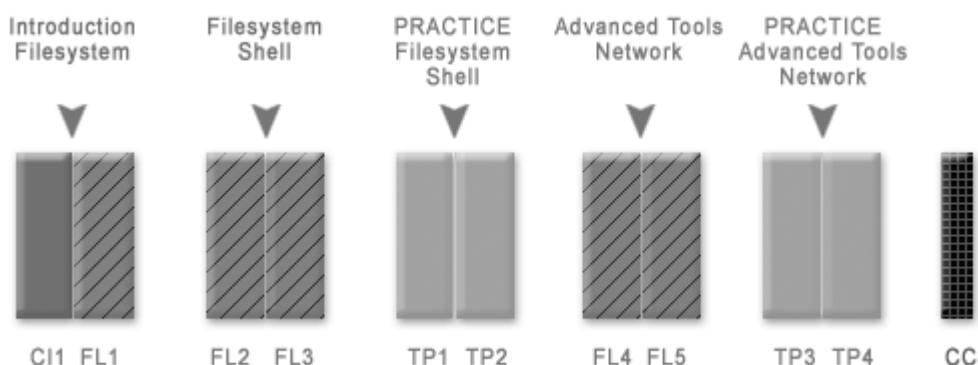


Figure 4: The course schedule

Figure 4 depicts a short overview of the scheduling:

- CI ("Cours Intégré"): lecture with practice in a lab. This is a mixed presentation of the course contents and the pedagogical platform.
- FL ("Formation en Ligne"): on line self-learning.
- TP ("Travaux Pratiques"): practice lab.

FL and TP alternate until the end of the course. During FL, the students sit in the practice lab with one computer per student and only one tutor is present to answer questions for all the rooms. For the TP, one tutor is available per group (room).

- CC ("Contrôle des Connaissances"): practical exam with one student per computer.

Assessments and feedbacks

Two evaluations take place at the end of the course: the students' and the tutors'.

Students' assessment

The assessment consists of an on-line questionnaire of fifty questions on different points:

- General information ;
- The IniTuX system ;
- Architecture of the course ;
- Contents ;
- Interactive illustrations ;
- MCQ ;
- On-line course interactivity ;
- Graphic explanations ;
- The three lifebelts rule ;
- Global feeling.

We won't give all the details in this paper but we will just show the main results. One interesting result is the amount of time students spent in self-learning every week (Figure 5). The average time was initially estimated at 6 hours per week.

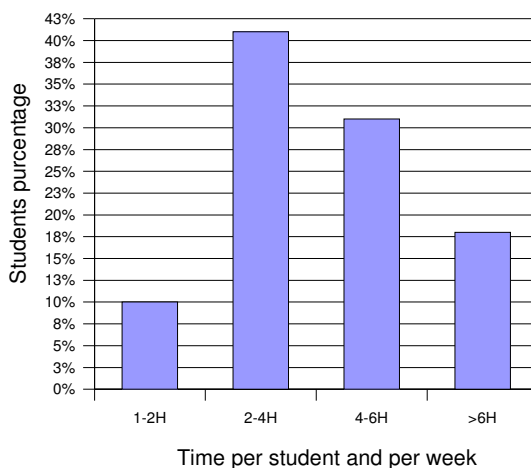


Figure 5: Time spent in self-learning

Another result is the global level of satisfaction of the students: more than 75% enjoyed the system. Other aspects of the course positively assessed were the rigorous structure of the contents and the mixed information partly in the student book and partly on-line. However, the rhythm was considered too hard to follow for half of the students.

For the year 2003, the system consisted of 115 HTML pages spiced with 58 interactive illustrations and 12 MCQ. MCQ were considered sufficiently useful to make progress. 80% of students like to learn with illustrations and

interactive mode.

Concerning the three lifebelts rule, students would like to get answers to their questions more quickly than they did in the forum of each group.

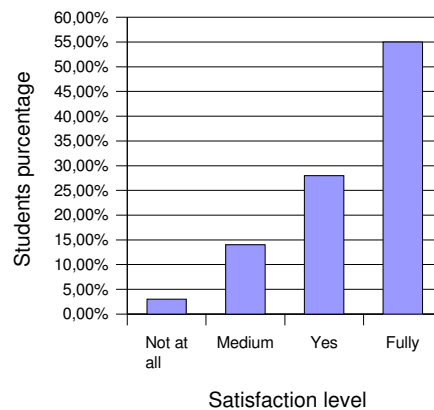


Figure 6: "Do you like the system ?"

As already shown and generally speaking, a lot of students were globally satisfied with the system. They were ready to follow another course built on the same model of blended learning.

We now play this system every year, taking into account all the requests that have been suggested by students :

- Reduce the self-learning period (less time from 3 hours to 1.5 hour) ;
- Alternate self-learning and practising ;
- Meet a teacher at least once a week.

Tutors' Assessment

The eight groups of students are tutored by eight tutors, really involved in the experiment from the design throughout the course itself. We show here some results concerning the conception time: over four years, there were eleven tutors and developers involved in the project ; most worked on the pedagogical goals and some of them on the technical developments. The total amount of design time is evaluated at 130 man-months. We should mention that the content of this course was stable and that the add-ons and improvements were relative to the system itself.

The results show that a significant part of the lecturer's time is saved: approximately 10%. This is a saving the first time the system has been used ; we hope that this will increase in the future.

The tutors who were involved in the experiment are pleased to see that the students played the game from the beginning until the evaluation. The results of the exam are better than the previous years regarding the level of practice. The goal was: Make the students more autonomous! It is easy to see that students feel really more comfortable when practising. Possibly due to the interactive illustrations which facilitate understanding and practice and also the operating system itself for providing ease of access to online contents.

The tutors have noticed that they must highlight certain points of the contents differently from that of traditional lessons. So the slides (web pages) that held the notions and sub-notions should be re-designed and sometimes their layout changed. A good point relative to the use of e-learning is that we hear the tutors speaking of "screenplay of a course" ; and this is really new!

The tutors stress the need for familiarity with the system right from the beginning of the course ; for example some students are shy with the forum and they must be used to it in order to make the system efficient.

The tutors really notice the changes in the way they teach, especially regarding the time they have to spend answering questions in the forum. They say they have to plan time in their diary, especially for these tasks (distance tutoring) so that they do not become too intrusive.

Conclusion

The team of teachers has been working on this blended learning system for several years and recognises that this year has been a step. The improvements are tangible and the students feel better about them. The system will be improved thanks to the evaluations of both students and teachers, but there won't be fundamental changes.

All of the tutors spent a lot of time to set up this system but they are ready to go on, being sure that this is a significant step in e-learning and e-teaching. The system seems to be applicable to other subjects. However, the difficulty is to find the "point of practice" and to build the illustrations or simulations that will fit well with the notions to be taught.

Acknowledgments

Thanks to all the teachers: Sophie Chabridon, Frédérique Silber-Chaussumier, Djamel Belaid, Éric Renault, Christian Parrot, Daniel Millot, Olivier Villin, and to our designer Steeve Jouannet.

References

Ganesha is used as the e-learning platform (cf. <http://www.anemalab.org/>) ; it's a free software which has been completed in order to add

- Statistics on students connections ;
- Mailing list for each group ;
- Forum for each group.

Other developments are relative to:

- Self-evaluation of the students ;
- Management of the groups linked with LDAP directory.

The collaborative tool which is used to build the system is **Picolibre** ; more information on the web site <http://picolibre.int-evry.fr/projets/initux/>.

More studies on our pedagogical choices can be found on our web site <http://www.int-evry.fr/tice> and especially in our conception guide: <http://www.int-evry.fr/tice/guide> .