Abstract

This paper presents a way of using eLearning in the Technical Higher Education by maintaining some balances in order to preserve the main advantages of standard education. It is about informative / formative, individual / guided balance, maintaining standards and skills, etc.

The use of eLearning technology has shown major advantages especially in companies that develop new equipment or new technologies to train employees to increase work productivity. In the case of pre-university education eLearning is applied as a complement to classroom lessons, using Internet resources or even Teach-ware produced by teachers. Teaching and learning in Higher Education has other objectives, of which the most important are: Teaching and learning in Higher Education is oriented for the adults in such a way to become professionals’ managers able to research, educate, lead processes, train themselves continuously etc. In the case of Engineering Education, the problem becomes even more complex because they must to lead processes where people interact not only with each other, but also with machines, equipment’s and energy. Standard education (sE) has solved this problem using an extensive educational algorithm facing the educator-student in the following stages: course; seminar; laboratory works; project; research; practical activity. It is important to maintain the benefits of standard education (sE), namely:

- Teaching and learning is based on paradigm “informative-formative”.
- Student assessment is made in front of the teacher.
- The sE education is guided by “standards and competences”, has extensive material support accumulated over many years by an army of staff trained to deliver education in line with these standards.

But there are disadvantages which by eLearning can be eliminated or reduced, such as:

- With all methods used for teaching-learning-evaluation, the requirements of the labor market are not met.
- Curricular Development of sE reform has produced a sophisticated curriculum that has complicated and further hampered educational processes so the reform has turned almost to the contrary.
- Moreover, some activities performed in schools are antagonist, say critics.

Technologies of eLearning can make a major contribution to education such as:

- Using the eLearning-synchronous variant combined with the seminar through tests.
- The tests will be continued by individual students through eLearning-asynchronous. This increases the individual study and makes the transition to the Teach less-learn more paradigm.
- Laboratory works will be individually modeled / simulated by the students through asynchronous eLearning.
- The project will take place largely through synchronous eLearning, contributing to the development of students’ research and design qualities, [2].

The above leads to the education paradigm: Teach less-learn more that eliminates many of the disadvantages presented above. In the final of the paper an example of application in the field of Automatic Control Systems is presented.

Keywords: Education algorithm, advantages disadvantages, educations paradigms, eLearning algorithm, system control applications.
1 INTRODUCTION

Standard education (sE) used for hundreds of years in Higher Education has set a multitude of qualities that ensured the training of staff needed to develop societies. Standard education (sE) has solved this problem using an extensive educational algorithm facing the educator-student in the following stages: course; seminar; laboratory works; project; research; practical activity. This represents the sE algorithm consisting of the Teaching and Learning Loop as shown in “Fig.1”.

![Fig.1 Teaching and learning loop in Standard education](image)

As shown in figure above to teach and learn a kind of matter is used 6 independent series activities: course, seminar, laboratories, project/design, research and practice. In the final the evaluation says if the matter is learned or not yet. If not, the loop continue until the assessment is at the required standards. This sE are advantages and disadvantages and take more time and costs.

The main advantages and disadvantages of sE are mentioned above:

- Teaching and learning is based on paradigm “informative-formative”. This is the basis for training professionals for medium and long-term;
- Student assessment is made in front of the teacher. This process assures grows of confidence, responsibility, contributes to achievement personality, enforces the young people to control their emotions as a good training for the labor market and real world.
- The sE education is guided by “standards and competences”, has extensive material support accumulated over many years by an army of staff trained to deliver education in line with these standards. They published a high percentage of all textbooks worldwide including those published online, even by MOOC’s.

But there are disadvantages, such as:

- With all methods used for teaching-learning-evaluation, the requirements of the labor market are not met. The contradiction between informative learning necessary in the development of the individual's career and the formative, based on the development of creativity and entrepreneurial education, required for easier access to the labor market, is not solved.
- A balanced informative and formative education requires a lot of time and money that cannot be covered by sE institutions.
- Curricular Development of sE reform has produced a sophisticated curriculum that has complicated and further hampered educational processes so the reform has turned almost to the contrary. The teachers require billions of children the schools all around the world to use their brains without providing some equipment oriented to it, [1].
- Moreover, some activities performed in schools are antagonist, say critics. In other words, the pedagogy constrains students of all ages to use the brain without providing suitable equipment’s and new technologies. All of these are perhaps the support of the 10/20/70 percentage released by MOOCs, saying that the school contributes to the development and achievement of the individual by only 10%.
• To this is added the use of a cumbersome and unattractive learning paradigm: “Teach more, learn more”.

The response of Higher education institutions to this challenge was to integrate in the curricula the following IT&C: media, mobile communications, new technologies in laboratories, and even the Synchronous eLearning. This kind of Standard education is based on the metaphor “Teach more - learn more” named Blended learning, [4]. Blended learning complicated the standard education very much, and it caused the loss of the eLearning values like: reduce time and costs and solve the requirements of the Labor market. This upgrading seems to have transformed the paradigm of standard education into “Teach more - learn less”. This has a negative impact of quality of education.

Increasing the Higher education efficiency mean assuring the balance between informative/formative education, for easier access to the labor market in minimum time and costs. The above-mentioned paper presents a way of using eLearning technology in Higher Education to increase the efficiency of education from today's bLearning,.

2 METHODOLOGY

The principle of increasing efficiency of bLearning consist of the following, “Fig. 2”:

• Use synchronous eLearning in classroom to teach using paradigm: Teach less learn more;

• Combining some of the Teaching / Learning loop using eLearning technology as follows: course, seminars, evaluations(tests); Laboratories, projects/design, modelling, simulation; research, practice, final evaluation(tests).

As shown in figure below, to teach and learn a kind of matter is used only 2 independent series combined activities: course, seminar and partial evaluation tests (first); laboratories, project/design using modelling and simulation; research, practice and final evaluation tests (second). In the evaluation tests, if the matter is not yet learned the students continue to learn using asynchronous eLearning and self-test, until the assessment is at the required standards. This principle has the advantages mentioned below: reduce the time and costs, develop the formative part of education to maintain a best balance with the informative part, integrate the teacher into the education cycle; design a good curriculum based on paradigm “Teach less - learn more”, [7]. Talking about the paradigm of education we can say:

- Teach more-learn more, should be good but is cumbersome for all.
- Teach more-learn less, is a natural involution of first paradigm.
- Teach less-learn more, is good to acquire the requirements of the labor market.
- Teach less-learn less, is an unwanted involution of the paradigm above.

![Fig. 2 Increase the bLearning by using eLearning in Teaching and Learning loop](image-url)
Each subject delivered to students should be organized on a 10-12 modules. First activity begins so: Teach the explanatory text of the module, a list of new knowledge, problem solving seminar, evaluation tests and conclusions. Evaluation tests and conclusions are developed in asynchronous eLearning mode. The second activity consist of laboratory works and project/design using modelling and simulation on PC by asynchronous eLearning mode. The final part of this activity is function testing on equipment’s. Third activity represent the research and external practice, which are developed in asynchronous eLearning mode.

3 RESULTS

In this paragraph of paper are presented an application on theme Analyze, modelling and simulation of feedback control Systems. This material will be treated using algorithm from “Fig.2”. The first section trait the use of linear controller as presented in the next figures.

3.1 Curse

Theme: Analyze modelling and simulation of feedback control systems

This module is treated using eLearning in synchronous mode as shown in “Fig.3”, where is presented a shot part of the lecture text. In next three picture, which is gated from eLearning platform, is presented a part of the course entitled Analyse, modelling and simulation of Systems Control with Feedback, [3].

![Fig.3. Analyse of feedback control systems](image)

To do this a linear controller variant: P, PI, PD and PID are used. In the next picture are analyzed two linear Controllers, PI and PID. For this are presented in detail the equations, transfer functions and diagrams of this Controllers, “Fig.4” and “Fig.5”.

![Fig.4. Analyse of feedback control systems](image)

![Fig.5. Analyse of feedback control systems](image)
3.2 Seminar and tests

Seminar is based on course and for the new concepts and definitions developed before and are synthesized in "fig.6". By using these concepts and definitions students have the opportunity to discuss how to use and which controller type is more efficient and under what conditions.

NEW CONCEPTS AND DEFINITIONS

- **ANTICIPATORY EFFECT**: Factory of the form $s$ is on the transfer function numerator, produce the developing of transfer diagram in positive sense, this mean forward unflued.
- **DELAY EFFECT**: Factory of the form $s$ is on the transfer function denominator, produce the developing of transfer diagram in negative sense, this mean backward unflued.
- **EXAMPLES OF ANTICIPATORY EFFECTS**: Differentiator ($D$) and $D_1$, $G(s)=Ts$; $G(s)=1+Ts$.
- **EXAMPLES OF DELAY EFFECTS**: Integrator $G(s)=1/Ts$, First order delay ($I$), $G_1(s)=1/(1+Ts)$; Second order delay ($II$), $G_2(s)=1/(1+T_1s+T_2s^2)$, Dead time ($T$), $G(s)=e^{-Ts}$.
- **PROPORTIONAL EFFECT**: Is an ideal effect $G(s)=k$.
- **CONTROLLER (REGULATOR)**: Device that process the error ? and return c the control output
- **CONTROL LAW**: Relation between Input and Output of Controller, $c(t)=f(I(t))$.
- **TRANSFER FUNCTION OF CONTROLLER**: $G_C(s)=k_1+1/Ts+T_2s$.
- **USED CONTROLLERS**: $P$, $G_P(s)=k_1$, $k_2=1+Ts$; $P_I$, $G_I(s)=Ts$; $P_D$, $G_2=1/Ts$.
- **PROCESS EXEMPLES**: $P_1$, $G_1(s)=k_1+1/Ts$; $P_2$, $G_2=1+Ts$.

The last part of these activities is allocated for tests [9]. The test used here is based on two methods, on "selected from three possibilities" and on "table of matching" as shown in "Fig. 7".
3.3 Laboratories, modelling and simulation

In laboratory the theory is verified using modeling and simulation platform, like Simulink or some equipment dedicated for these activities. In the next we transform the transfer functions of PI and PID Controllers in differential equations to do a Simulink model.

For PI: \( G(s) = K_R (1 + \frac{1}{T_i} s) \) and equation will be, \( c = K_R \left[ u + \frac{1}{T_i} \int_0^t u \, dt \right] \).

For PID: \( G(s) = K_R (1 + \frac{1}{T_i} s + \frac{T_d}{s}) \) and equation will be, \( c = K_R \left[ u + \frac{1}{T_i} \int_0^t u \, dt + T_d \frac{du}{dt} \right] \).

In the "Fig.8" and "Fig.9", the model and simulation results are presented. This can be done synchronous or asynchronous mode.
3.4 Practice using devices, equipments and instalations

In the picture of Fig. 10 is presented the System Control for regulating speed of an Induction Motor Drive. They are hardware and software parts. The structure of hardware on the direct way consist of Set point SP, Comparison element CE, Programable Digital Controller C, Executive equipment E, and Motor Drive as the process. On feedback way has speed transducer T using a Thao-generator TG. His signal is the second input to CE which close the feedback loop.

![Fig. 10 Exemple of Control System with Feedback for controlling speed of Induction Motor Drive.](image)

Here can be used several kind of control laws, as for exemple PI which is modelled by software using Ladder programming on PC and then downloaded into Controller. Then the System is ready to use [7].

4 CONCLUSIONS

Traditional education has values gained in many years as follows: it creates techno-scientific personalities through teaching / learning and evaluation in front of teachers. Education is guided by "standards and competencies".

Education is based on the "informative-formative" concept and maintaining the balance between the taught knowledge and the formed skills that must ensure the preparation of the individual in the medium and long term.

Traditional education has many critics as follows: Some activities performed in schools are antagonist, and many programs from sE is unattractive even boring. With all methods used for teaching-learning-evaluation, the requirements of the labour market are not met.

The sE use the paradigm "Teach more - learn more" which for many students leads to "Teach more - learn less" which is un acceptable.

Reform of education was focused on Curricular Development of sE has produced a sophisticated curriculum that has complicated and further hampered educational processes so the reform has turned almost to the contrary.

The main objective of this paper is to increase the efficiency of education by preserving and reinforcing the traditional values of sE and attenuation his disadvantages with the help of eLearning technology.
The teaching loop which contains two packages, first the theory, course, seminars, projects, evaluations(tests) and second, laboratories, modelling, simulation, research, practice, final evaluation are shared between eLearning synchronous and asynchronous technology. The teaching will be sharing as following: Theory to be taught in the synthesis by synchronous and in-depth eLearning individually by asynchronous eLearning.

To increasing the efficiency of Blended Learning (bL) used today in Higher Education a principle based on paradigm “Teach less learn more” is proposed. This mean: Use in classroom for teach course, seminar, project and testing, eLearning synchronous combined with asynchronous in proportion of 30/70% respectively. Use modelling/simulation for laboratory works and synchronous eLearning for experiments on installations and final testing.

REFERENCES


