Model of Educational Counseling System in Initial and Continuous Training

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Abstract: In order to develop a theory about the value related to forecast educational counseling system is necessary to build models that reflect real essence of phenomena. In this purpose, data and statistical can suggest the best model type and can have great practical value. In describing the phenomena pedagogical specific to educational counseling process may use mathematical models of real processes of gathering, transmission, processing and use of information, because education counseling can be largely considered as having two essential facets: the accumulation of information in memory and skills development make the connections and relationships for effective use of knowledge.

Key-Words: People Flow Model, Counseling Activity, Initial Training, Continuous Training, Intellectual Rights

1 Introduction

Given a number of important objectives to be aimed at the education counseling system in our country but also worldwide: abolition of illiteracy, reorganizing the entire education counseling, from the primary up to postgraduate, so that individuals acquire skills and knowledge necessary to adapt at the contemporary society, we can develop mathematical models to obtain optimal solutions to achieve those objectives.

2 Education counseling systems - open system

Study of the educational counseling system, as also of any system can be done by going through several stages. First, it have be defined the system itself in relation with our purposes.

Next will be presented schematically several possible representations of the educational counseling system, according to the purpose of the objective pursued, and according to these representations can be build mathematical models, according to key issues presented.

It can be studied the situation where, building on existing features of the system, we can achieve objectives or not. Also, in a further study it can be studied the amendments of the system for fixed targets to be achieved. If possible, the objectives set can be achieved in several ways, it is necessary to study these means in order to achieving the objectives it may be considered optimal (in a way which should also set). Solving these problems, put here in general terms, it will be the subject of the following paragraphs.

We consider a subsystem, any educational counseling system, particularly tertiary education counseling may be subsystem (because this is the target system), and will introduce a number of sizes that characterize the numbers of students (we are located in a more general model - which can be applied for other subsystems - which can be found in earlier schemes). According to this, inputs expressing the system must be equal outputs of the system.

\[ S_t + R_t + E_t = G_t + L_t + D_t \] (1)

where:

- \( S_t \) - is the number of students in the subsystem at the beginning of \( t \), students who were in period \( t-1 \) into a subsystem immediately below (in this case high-school);
- \( R_t \) – is the number of students who repeat the courses, students who were in period \( t-1 \) in the same subsystem, higher education;
- \( E_t \) - is the number of students from outside the education system - external (foreign students, gifted children, persons enrolled in college in a period of more than 1 year of high school);
- \( G_t \) - the number of graduates at the end of period \( t \) the subsystem;
- \( L_t \) - the number of students leaving subsystem during \( t \) (folds, disease, etc.);
- \( D_t \) - is the number of students who died in the period of time \( t \).

This relationship can be represented by the scheme:
We have thus:

\[
\begin{align*}
\dot{E}t &= E^{1}\dot{t} + E^{2}\dot{t} \\
\dot{L}t &= L^{1}\dot{t} + L^{2}\dot{t} \\
\dot{D}t &= D^{1}\dot{t} + D^{2}\dot{t}
\end{align*}
\]  

(2)

where, if we consider time axis in time \( t \), may be set for time \( t \). In this case the first term of the amounts represent the number of students who leave/enter the system before the time fixed \( t \), and the second term of the sum represents the number of students who leave/enter the system after fixed time \( t \).

If \( N_{i} \) is denoted by the number of students which are at time \( t \) in the subsystem considered two identities are obtained easily verified:

\[
\begin{align*}
N_{i} &= S_{i} + R_{i} + E_{i} - L_{i}^{1} - D_{i}^{1} \\
N_{i} &= G_{i} + R_{i+1} + L_{i}^{2} + D_{i}^{2} - E_{i}^{2}
\end{align*}
\]  

(3)

It can be easily observed that if we remove \( N_{i} \) between the identities (3) and (4) and taking into account the relations (2) we obtain the identity (1). If time \( t \) coincides with the beginning of the period considered, then the relations (3) and (4) gets the forms:

\[
\begin{align*}
N_{i} &= S_{i} + R_{i} + E_{i} \\
N_{i} &= G_{i} + R_{i+1} + L_{i} + D_{i} - E_{i}^{2}
\end{align*}
\]

because in this case, obviously:

\[ L_{i}^{1} = D_{i}^{1} = 0 \]

We will continue to record the internal structure of the education system – globally speaking, taking into account all the subsystems that belong to the whole education counseling system. It is noted with \( I_{1} \) crowd subsystems that are accessible to pupils, whether they have been included in other forms of education counseling, and \( I_{2} \) crowd subsystems which are accessible only to students who have previously done some studies. Identities 1, 2, 3, 4 - are checked for each subsystem \( i \in I \), \( I=I_{1}\cup I_{2} \).

The variables involved in these relationships, will attach higher index \( I \), for showing that they are fit to the subsystem \( i \in I \).

It can be now define the production of the education counseling system for each subsystem \( i \in I \), by the formula:

\[
W_{i,k}^{i} = G_{i,k}^{i} + \sum_{j=1}^{k} L_{i,j}^{2} + \sum_{j=1}^{k} L_{i,k}^{ij}
\]

(4)

where they used the following notations:

- \( W_{i,k}^{i} \) is the number of students leaving the education counseling system between period’s \( t \) and \( t + k \), having the appropriate knowledge subsystem \( i \in I \).

- \( G_{i,k}^{i} \) the number of graduates leaving the subsystem \( i \in I \) subsystem between periods \( t \) and \( t + k \) and which are not in further study.

- \( L_{i,k}^{ij} \) the number of pupils leaving subsystem \( j \in I \) before period \( t + k \) and which are considered as having the appropriate knowledge graduate subsystem \( i \in I \).

- \( L_{i,k}^{2i} \) the number of pupils leaving subsystem \( j \in I \) after \( t \) period and are considered graduate level of knowledge appropriate subsystem \( i \in I \).

Identities 1, 2, 3, 4 are useful to determine indexes which can analyze school flows (including flows in higher education counseling).

3 Models system structure refers to initial training and intellectual rights

3.1 Mathematical model - the general case

A first mathematical model of the system of education counseling can be obtained starting from the functional dependence between the total population and total number of students in the school system.

If we note with \( L_{t} \) - population at time \( t \), then the number of pupils in the school system at time \( t \) is:

\[
N_{t} = f(L_{t})
\]

(5)

where \( f \) is a known function (determined primarily based on previous evolution detected according to available statistics).

Let’s take the simplest case, assuming that \( f \) is a linear function.

In this situation the relation (5) becomes:

\[
N_{t} = h \times L_{t}
\]

(6)

This linear model allows comparison of conditions of education counseling in different times or in different places, taking the rate indicate the relationship \( h \) (6); the indexes \( h \) determine the ratio of trained population and the total population (known in practice as indicative of the type: number of pupils per 100 inhabitants, or number of students to 10,000 inhabitants, etc.).

Relations of type (5), (6) permit the determining of the future evolution of numbers students school using demographic projections for the value of the
variable \( L_n \) and knowing the value of variable \( h_i \) indices.

There are several disadvantages of the model (5). First, use \( h_i \) indices for comparison between conditions or education counseling at several different places, can lead to erroneous conclusions, since these indices reflect not only differences in the education educational counseling system, but differences in population structure.

Second, these indices give no information concerning the structure and internal operation of the system of education counseling.

Thirdly, the model (6) does not give any indication of changes in coefficient \( h_i \) time, nor the causes of these changes.

Of course, that model (5) or (6) can not be detailed taking into account age and sex of students, subsystem considered, the geographical environment (urban/rural) and other features.

If for example consider only age, then the model (6) becomes:

\[
N_v = h_v \times L_v
\]

where \( v = 1, 2, \ldots, V \) is the index that shows age.

It can be make up the model linear (7), tables of survival for the school population, similar mortality tables used in demography.

This model takes into account the internal structure and functioning education counseling system.

The previous model was not taken into account in any internal composition and functioning of the education counseling system.

Next we refer to model educational counseling system (the same model can be applied to any subsystem of the education counseling system, and hence the higher education counseling - but there have made a few remarks).

First it is important to have an overview of the model that takes into account the structure of flows and functioning education educational counseling system.

For each subsystem \( i \in I \) of the education counseling system can rewrite the identities:

\[
N_i^t = S_i^t + R_i^t - L_i^t - D_i^t, i \in I
\]

\[
N_i^2 = G_i^t + R_{i+k}^t - L_i^t - D_i^t, i \in I
\]

(8)

If we assume that:

\[
E_i^1 = E_i^{2t} = 0, i \in I
\]

For each subsystem \( i \in I_1 \), students enrolled at beginning of period \( t \) as new arrivals (the number is \( S_i^t \)), are come from the graduates of other subsystems which are leaving the subsystems before \( t \) period (usually in times \( t-k \), where \( k \) is any) and of those who have not been part of the education counseling system (new enrolled). So an equation is justified as:

\[
S_i^t = \sum_{j \in J} f_i^j (G_{i-k}^j) + \psi_i^j (L_{1i}, \ldots, L_{ni}), i \in I_1
\]

where \( L_{ni}, v = 1, V \) is representing the population of age \( v \) in \( t \) period.

For subsystems \( i \in I_2 \), new entries \( S_i^t \) may only come from graduates of other subsystems and so is justified an equation of the form:

\[
S_i^t = \sum_{j \in J} f_i^j (G_{i-k}^j), i \in I_2
\]

(11)

Following equation can be easily justified:

\[
\begin{align*}
R_{i+k}^t &= f_{i+k}^t (N_i^t), i \in I \\
I_i^1 &= y_i^1 (S_i^t, R_i^t), i \in I \\
I_i^2 &= y_i^2 (N_i^t), i \in I \\
D_{i+k}^t &= l_{i+k}^2 (S_i^t, R_i^t), i \in I \\
D_i^2 &= l_i^2 (N_i^t), i \in I
\end{align*}
\]

(12), (13), (14), (15), (16)

Equations (8) - (16), the only exogenous variables are \( L_{ni}, v = 1, V \), provides a general form of mathematical model of the education counseling system to determine future flows of students, once we know the functions appearing in the previous (f, y, l).

With the definition for production system of education counseling for each subsystem \( i \in I \), given by formula:

\[
W_{i+k}^t = G_{i+k}^t + \sum_{j \in J} f_{i+k}^{2j} + \sum_{j \in J} L_{i+k}^{2j}
\]

(17)

it can be determined the future trend of production system of education counseling. Also, it can be determined the educational counseling structure of the future population. This structure, in a certain period \( t \), is given by the number \( Q_i^t \), of persons who are not parts of the students included in the school system and who have the appropriate knowledge of training graduates subsystem \( i \in I \). If we note \( \mu_i \), the mortality rate for the population with the level of training \( i \in I \), and \( \mu_i^0 \) the mortality rate for the production system of education counseling between periods \( t \) and \( t + k \), then we have the equation:

\[
Q_{i+k}^t = (1 - \mu_i)Q_i^t + (1 - \mu_i^0)g_{i+k}^t
\]

If the functions involved in the model (8) - (16) is
assumed to be all linear - (take the simplest case),
then we obtain:

\[
\begin{align*}
N_i^i &= S_i^i + R_i^i - L_i^i - D_i^i, i \in I \\
N_i^j &= W_i^i + R_i^{1+k} + L_{i+k}^i + D_i^{2}, \\
S_i^j &= \sum_{j=1}^{I} \alpha_{ij} G_{i-j} - S_i^j, i \in I_2 \\
R_{1+k}^i &= \alpha_{ii} (N_i^i), i \in I \\
L_i^1 &= \pi_i(S_i^1 + R_i^1), i \in I \\
L_i^2 &= \pi_2(N_i^1), i \in I \\
D_i^1 &= \mu_i'(S_i^1 + R_i^1), i \in I \\
D_i^2 &= \mu_2(N_i^1), i \in I \\
\end{align*}
\]

(18),(19),(20),(21),(22),(23),(24), (25) where:

\[
S_i^j = \psi_i^0(L_{i1}, \ldots, L_{iV}), i \in I_1
\]

(26)

Coefficients \( \alpha_{ij} \), \( \pi_{ij} \), \( \mu_{ij} \) introduced have the following meaning:

- \( \alpha_{ij} \) represents the percentage of graduates of subsystem \( j \), that enter the subsystem and \( i \) for \( i \neq j \) and the rate of repeat for \( i=j \).
- \( \pi_{ij} \) represents the percentage of students who leave the subsystem and (before time \( t \) for \( k = 1 \) and after this time for \( k = 2 \));
- \( \mu_{ij} \) represents the percentage of students who died in subsystem \( i \) (before time \( t \) for \( k = 1 \), and after this time for \( k = 2 \)).

4 Continuous training of teachers

Quality assurance processes for training of teachers is a matter of extreme political complexity of European education systems. Until 2000, the EU Member States there was a number of concerns, relatively sporadic and isolated, to improve quality assurance system, but once the Lisbon European Council (March 2000) have outlined two major initiatives. The first was a confirmation of the need for structuring national strategies for quality education and training processes that include concrete mechanisms to maximize the quality of experiences and processes associated with training and professional development, the second major initiative was the provision appropriate report (European Council, 2002) on the future objectives of education and training has been identified increasing quality and efficiency of education and training as one of the strategic objectives agreed by european member states.

Access to knowledge is an essential aspect of knowledge training. Trainers are key players in any strategy that has regard to the stimulation and development of a society or economy.

The key elements are:

- appropriate support teachers and trainers so that they meet the challenges of a knowledge-based society;
- definition of powers, including minimum and information and communication technology kills, which teachers and formators should have with regard to their role in the knowledge society;
- ensure adequate qualifications for new entrants into the profession, in all subjects and levels and make more attractive the teaching profession or trainer.

Continuous training activities in each adult and young training center should be organized by specialized personnel sustained involvement of state or private institutions active in their local community and may also provide expert assistance in solving specific cases. For any training activity conducted by foreign suppliers are harnessed to the school, it must be known both in charge of training and other teachers and the teacher in receipt of a skills development training should be established in the life school with problems which followed the training, the achievement of performance in work, by successfully solving other tasks facing the teaching staff and, not least, by initiating new activities or programs, the effects visible both to other teachers and for classes. When references are made to the theoretical effects of training on improving the quality of the educational benefit and teachers can see a complex interrelationship: psychological - teaching - management, forming the following links:

- at the time of implementation, training itself involves a query on operational gaps in the interaction of the teacher with the group (class of students);
- link between the formation and storage of professional knowledge, reflect a normal process of growth through learning and exploitation of knowledge acquired volume;
- link between education and social climate that reflects the contribution of training to improve the social climate of the group facilitating interpersonal relations;
- link between training and involves increasing the general education teacher of each broadly and managerial culture in the narrow sense;
- link between professional knowledge and social climate forward interrelationship that exists between increasing the amount of information and procedural skills, so that the resultant process of training to continue building a developed management skills-
teaching:
- links between intellectual capital, capital and materials and performance flexibility, reflecting the high level of psycho-pedagogical professional culture on productivity across the group and add as changes daily performance of the work of teaching. Continuous training is becoming a framework of adult cognitive level, emotional and psychosocial, providing an opportunity for personal development to enable it to develop new skills and knowledge to adapt to environments that are a changing. In the ongoing training of teachers, those formats are not only an object of training, but training is open to active elements of a partnership with trainers. Continuous training teaching approach is one focused on educated so that the trainer role is to set the context, the context in which education is self-forming.
Teacher training should be a priority of the Romanian educational system. Reform of initial and continuing training is not an end in itself but a prerequisite for achieving the essential mission: teaching career (a career teaching real, focused, motivated and open to teachers in Romania.

5 Conclusions
Changes in society and forecast accelerating changes in the stages to come require necessary not only to adapt education systems to new economic realities, social, cultural and scientific, but also formation in these systems capacity adjustment autoperpetuare continue and adaptability. From this light lines become permanent education principles guidance for educational activities in general and education adults is a segment whose emphasis may be considered a non-priority item. Living in a society knowledge based, individuals are faced with to-and permanent structure their own way of access to information and its capacity to select the information.

References: