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ONE APPROACH FOR DEFINING A PROCEDURE FOR DEVELOPMENT OF COLLEGE CURRICULUM

Higher education reform and Bologna declaration demand necessary changes in college curriculum. While changing college curriculum it is necessary to respect some solutions in existing curriculum. Sometimes, this results in non-consistent new curriculum, with opposite element in it. One approach for defining a procedure for development of college curriculum is proposed in this paper. This approach consists of three stages. In the first, “general” stage, the main parameters (i.e. number of semesters, number of courses per semester and number of ECTS credits per course) of curriculum are defined with the ranges of its values. For example, the number of courses per semester between 4 and 6, the default number of ECTS credits per course can be 5, 6 or 7.5, etc. In this stage it's necessary to take into account the mentioned parameters in the other, especially European colleges. In the second, “tuning” stage, concrete college defines the exact values or small ranges of parameters. For example, 5 courses per semester, 6 ECTS credits per course. In the third, “fine tuning” stage colleges analyze the differences between new and existing curriculum, and adjust the parameters of a new one. For example, some of courses can be expanded or reduced to achieve default number of ECTS credits. Creation of a numeric parameter is suggested as a measure of difference between two curriculums, which can be useful to compare two or more curriculum.

This approach is illustrated on examples for two colleges (technical and business) located in Southeast Europe taking into account new educational and social conditions and keeping in mind traditional values of society.

MODEL

Parameter table

All parameters to evaluate a curriculum are divided into categories (Table 1). The categories *Courses*, *ECTS*, *Lectures* and *Other contact hours* deals with curriculum structure, until the category *Courses' content* (>70%) which deals with education content. If it is necessary, the new categories can be added, for example *Delivery method*.

All categories have the same four subcategories: *offered*, *to finish*, *compulsory* and *elective*. The subcategories are derived from the courses status: compulsory or elective. The two last categories are the number of compulsory and elective units given by category, respectively. The category *offered* is the appropriate number of both *compulsory* and *elective* offered to student, and *to finish* is the appropriate number necessary to finish program.

The category *Courses* deals with number of courses per program and semester. If programs compared have different year schedule (semester, trimester, blocks), semester consideration must be replaced with year one.

The category *ECTS* deals with number of ECTS credits per program, semester, and course. If programs compared have the other system of credits, this system can be used only if all programs have the same credit system. Otherwise, all credit systems need to be converted to ECTS.

The categories *Lectures* and *Other contact hours* mean the appropriate number of hours per program, semester and course.

The category *Courses' content (>70%)* is the number of courses which overlies more than 70% with the appropriate course from second compared program. The limit different from 70% can be used too.

All categories and subcategories are presented in rows of Table 1. In the columns of table *the parameters families* of are presented. There are three possible families: *per program*, *per semester*, and *per course*.

All parameters families have the same parameters: *S1min*, *S2min*, *Average*, *Reference*, *Deviation%*, *S2max*. Label *S1* in the parameter name means the stage one of development process, and *S2* means the second stage. Label *min* and *max* use to mark the minimal and maximal value of parameters.

The interval from *S1min* to *S1max* is generally wider than *S2min* to *S2max*.

The value of *Average* need to be calculated by using expression:

$$Average = \frac{1}{n} \sum_{i=1}^n V_i \quad (1)$$

where there are *n* is number items and *V_i* is the value of item *i*.

The *Deviation %* is calculated using:

$$Deviation\% = \frac{Average - Reference}{Reference} \cdot 100\% \quad (2)$$

In situation with large data dispersion we can use the expression:

$$Deviation\% = \frac{\sqrt{\frac{1}{n} \sum_{i=1}^n (V_i - Reference)^2}}{Reference} \cdot 100\% \quad (3)$$

The values of *Reference* generally qualify the desired values. How adopt the value of *Reference* will be explain in the application example bellow.

Procedures

Development of a curriculum

Stage One

1. By analyzing the curriculums of other similar institution, define the values for $S1min$ and $S1max$.

Stage Two

2. By analyzing the own curriculum, define the values for $S2min$ and $S2max$.

Stage Three

3. Calculate *Average* using expressions (1).
4. Adopt *Reference*.
5. Calculate *Deviation %* using expressions (2) and (3).
6. Calculate overall deviation per program, semester and course using expression:

$$Shift = k_j DEVIATION \%_j \quad (4)$$

$$DEVIATION \%_j = \frac{\sum_i abs(Deviation_i)}{4} \quad (5)$$

$$\sum k_j = 1 \quad (6)$$

$Deviation \%_i$ is the appropriate value for category and parameter family.

Values of k_j can be chosen as follow:

	Per program	Per semester	Per course
Courses	0.125	0.125	X
ECTS	0.125	0.125	0.25
Lectures	0.125	0.125	0.25
Other contact hours	0.125	0.125	X
Courses' content (>70%)	0.50	0.50	0.50

7. If *Shift* is unsatisfied go to step 2, otherwise: end of procedure.

Two curriculum approaching

The procedure is generally the same, but *Reference* adopting is different. Reference values are generally closer to the "stronger" institution. If we use exact values of one institution, *Shift* means the "distance" of two institutions.

APPLICATION EXAMPLE

Table 1 Show the parameters for E-BUSINESS program in College of Economics, Valjevo, Serbia and Montenegro. The values for *Average* are obtained from program data. The desired new program is modeled by values of *Reference*:

- 6 courses offered per semester,
- 5 courses necessary to finished semester,
- 3 compulsory and 2 elective courses;
- 6 ECTS credits per course,
- 37.5 lectures hours and 37.5 other contact hours per course, etc.

The *Deviation%* values are calculated by expression (2).

It can be noticed that, it's not necessary to calculate absolutely all parameters. The category *Courses' content (>70%)* is not calculated because there are no intention to change courses' contents more than 30%.

Table 1 Parameter table for E-BUSINESS program Valjevo

		Per program						Per semester						Per course									
		S1min	S2min	Average	Reference	Deviation %	S2max	S1max	S1min	S2min	Average	Reference	Deviation %	S2max	S1max	S1min	S2min	Average	Reference	Deviation %	S2max	S1max	
<i>Courses</i>	<i>offered</i>	30	30	35	35	0%	40	40	4	4	7,5	6	25%	6	10								
	<i>to finished</i>	20	25	31	30	3%	35	30	4	4	6,3	5	25%	6	10								
	<i>compulsory</i>	10	15	16	15	7%	20	30	2	2	3,5	3	17%	4	10								
	<i>elective</i>	0	15	15	15	0%	20	20	0	2	4	2	100%	4	6								
<i>ECTS</i>	<i>offered</i>	180	180	240	240	0%	240	240	30	30	40	36	12%	36	45			4,9	6	-19%			
	<i>to finished</i>	180	180	180	180	0%	180	180	24	24	30	30	0%	36	36			4,9	6	-18%			
	<i>compulsory</i>	80	100	99	100	-1%	120	180			17	18	-8%					4,6	6	-23%			
	<i>elective</i>	0	143	143	140	2%	143	120			24	18	31%					5,1	6	-16%			
<i>Lectures</i>	<i>offered</i>			1347	938	44%					283	188	51%			15	15	44	38	18%	45	60	
	<i>to finished</i>			1025	781	31%					236	156	51%					44	38	17%			
	<i>compulsory</i>															15	15	42	38		45	60	
	<i>elective</i>															15	15	45	38		45	60	
<i>Other contact hours</i>	<i>offered</i>			688	938	-27%					104	188	-45%					16	38	-57%			
	<i>to finished</i>			600	781	-23%					85	156	-46%					16	38	-57%			
	<i>compulsory</i>																	17	38	-54%			
	<i>elective</i>																	16	38	-58%			
<i>Courses' content (>70%)</i>	<i>offered</i>																						
	<i>to finished</i>																						
	<i>compulsory</i>																						
	<i>elective</i>																						

The values for *DEVIATION_j%* and *Shift* are calculated by expressions (4), (5) and (6) and shown in Table 2. It can be noticed that the most important changes are planned in the structure of semesters (13%) and courses (11%). The most significant changes in semester structure are in category *Courses* (42%) as well as category *Other contact hours* in course structure (57%). The percent values mentioned above can be treated as effort needed to make changes. It is estimated that all changes greater than 10% are "hard", so it is impossible to make all desired goals.

Table 2 Overall *Deviation%* parameters

	Per program	Per semester	Per course
<i>Courses</i>	3%	42%	0%
<i>ECTS</i>	1%	13%	19%
<i>Lectures</i>	19%	25%	9%
<i>Other contact hours</i>	12%	23%	57%
<i>Courses' content (>70%)</i>	0%	0%	0%
<i>Shift</i>	4%	13%	11%

As the second example, a *Shift* between E-BUSINESS program in College of Economics, Valjevo is compared with E-BUSINESS program in College of Electrical Engineering, Belgrade. The calculation made by replacing the values *References* in Table 1 with appropriate *Average* values from E-BUSINESS program Belgrade. As we can see, there are significant differences in program and semester structure. It is concluded that the *Shift* below 20% is acceptable for student mobility, but for planned collaboration it's recommended to decrease differences below 12%.

Table 3 Overall *Deviation%* parameters to compare two programs

	Per program	Per semester	Per course
Courses	44%	106%	0%
ECTS	54%	35%	31%
Lectures	13%	33%	9%
Other contact hours	11%	19%	57%
Courses' content (>70%)	0%	0%	0%
<i>Shift</i>	15%	24%	12%

CONCLUSION

While changing college curriculum it is necessary to respect some solutions in existing curriculum. The three stages approach for defining a procedure for development of college curriculum is proposed in this paper. Creation of the numeric parameters is suggested as a measure of differences between two curriculums, a new one and existing curriculum or two curriculums need to be approached. These parameters can be used as an effort to make changes. The approach is illustrated on examples for two colleges. Meaning of parameters obtained is estimated.

REFERENCES

1. Curriculum 2004, College of Electrical Engineering, Belgrade, Serbia & Montenegro
2. Curriculum 2004, College of Economics, Valjevo, Serbia & Montenegro