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Impact of specialization in sciences of the teachers on the development of basic competences and the choice of the scientific option by 7th and 8th pupils in the schools of Lubumbashi

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Abstract
This article presents the situation of the teaching and the training of sciences (physics and chemistry) at the pupils of the Final Cycle of basic Education.
This article is interested particularly in the full-time teaching staff of the course of the physical sciences and technology formed in the Teachers Training College of education (TTCE) and in the impact of their specialization on the development of basic competences and the choice of the scientific option to humanities by the pupils of 7th and 8th of basic education in the sub-division of Lubumbashi I**.** It presents initially the specialization of the teaching personnel and the number of credits followed in chemistry and physics during the university career. Then, it is interested in the descriptive data drawn from the questionnaires intended for the pupils concerning two fields of information that is 1) the proportion of the contents of chemistry and physics envisaged with the program really studied 2) the perception of sciences by pupils. The article also examines the relations between the choice of the scientific option to humanities and the variables of these two fields.

Keywords: specialization, sciences, pupils, competences

1. Introduction

For a few years, the Congolese government is concerned with quality of the trainings in sciences. This attention emanates from the importance which sciences have taken in the industrial development of the countries (Conseil économique du Canada, 1990 ; Larochelle, 1995; Service National de Formation, 2019; Herry, 2000) [1, 9, 15, 4].Since 2016, the Congolese government has set up the process of the reform of the Education system which started with the drafting of the innovated educational programs of the Field of Training of Sciences (FTS) for the Final Cycle of basic Education (FCBE).This reform spreads on the other levels of scientific humanities (National Service of Formation, 2019).

The reformed educational programs are centered on the Situation-Based Approaches (SBA): they aim primarily at the activity of the pupil in situations which enable him to act on the essential Knowlege (Korezt,1994; Gabrielson, 1995) [7, 3]. The same educational programs present at the teacher the elements which it needs to manage this activity of the pupil in class.

KASANYA (2022) [6] has in his dissertation of masters shown the disappointing contribution from the programs from the FTS for the FCBE to the formation as well intellectual as socio-emotional from learning.

Because among basic competences defined in the programs of the field of training of the physical sciences and technology by the ministry of primary, secondary and technical education, only less than 25% are developed by the pupils of the final cycle of basic education in physical sciences and more particularly in the discipline of chemistry. The specialization of the teachers plays a dominating role in the process of enseignement/apprentissage, because the deficit of the qualified teachers in an educational structure resulting in the deficit of the effectiveness of the transmission of the disciplinary contents impacts negatively on the development of competences of the students (Meq, 2001; OCDE, 2013) [11, 13].

The specialization of the teachers in sciences (physics and chemistry) could be a cause among so many others of the non development of competences by learners from the FCDE in physical sciences. Because according to results' of the survey carried out by Kasanya (2022)[6] near 38 teachers of sub-division of Lubumbashi I, only 44,77% of full-time teaching staff of a course of the physical sciences and technology with the FCBE (7th and 8th years) were formed in the ISP. Professors of the TTCE all were not formed to teach chemistry and physics.

This article is interested particularly in the teachers responsible for the course of the physical sciences and technology formed in the TTCE and in the impact for their specialization on the development for basic competences and the choice of the scientific option to humanities by the pupils for 7th and 8th for basic education in sub-division Lubumbashi I**.** It presents initially the specialization of the teaching personnel and number of credits followed in chemistry and physics during the university career. Then, it is interested in the descriptive data drawn from the questionnaires intended for the pupils concerning two fields of information that is: 1) the proportion of the contents of chemistry and physique envisaged with the program really studied 2) the perception of sciences by pupils. The article also examines the relations between the choice of the scientific option to humanities and the variables of these two fields.

2. Materials and Methods

To collect our data, we carried out an investigation with semi questionnaire open and directional. This method of investigation was supported by the techniques of interview and documentary analysis.

2.1 Sites of study and Sampling

2.1.1 Sites of study

We undertook our research in the subdivision of Lubumbashi I, one of the subdivisions of the educational province of Haut-Katanga I in Democratic Republic of Congo (DRC). The reason which pushed us to retain this subdivision among so many others is the facility to reach the majority of schools being in the center of the city and its surroundings. During our pre-investigation we had counted with the complicity of the persons in charge of the subdivision 63184 pupils and 4499 teachers for all sections and confused classes. And for the classes of 7th and 8th only, we had counted 3012 pupils and 168 teachers teaching in 7th and 8th of basic education.

2.1.2 Sampling of the schools and teachers of the physical sciences and technology

The 229 schools of the Lubumbashi1 subdivision function in management modes. To make our study, during our pre-investigation, we had counted with the complicity of the persons in charge of the subdivision six management modes. To this end, each mode of management was represented by the number of schools which it contains divided by six (a number of modes), we assigned at each school a number by mode of management. After we cut and folded these numbered papers, then we carried them in a ballot box. We operated a pulling randomly. At the end, the random sampling showed the names of 38 schools selected. Curiously in each selected school, the course of the physical sciences and technology of 7th and 8th were taught by a same professor. The sample size of the teachers finally retained is 38 (with more than 89 % of teachers evolving/moving in the private schools) who constitute the small-scale model drawn from all the teachers of the subdivision of Lubumbashi I who form together the universe of investigation (the population mother). In the table1, we represent the number of schools and teachers selected by management mode.

Table 1: Sampling of the schools and teachers

Retwork	PA	NC	CC	PC	AC	KC	Total
Number of schools	206	9	8	3	2	1	229
Number	34.3	1,5	1,3	0,5	0,33	0,16	38,09
Rounded number	34	2	1	1	0	0	38

PA : Privates Approved **; NC :** Not Conventional **; CC :** Catholic Conventional**, PC :** protestant conventional**; AC :** adventist conventional **& KC :** Kimbanguist conventional.

2.1.3 Sampling of pupils

The time constraints and the reasons of convenience on the ground pushed us to retain 10 pupils per school (that is to say 5 pupils of 7th and 5 pupils of 8th). For each class we assigned with all the names of the register of call a number. After we cut and folded these numbered papers, then carried in a ballot box. We operated a pulling randomly. At the end, the random sampling showed the names of the pupils selected. The sample finally selected is of 380 pupils (at a rate of 10 pupils per selected school) who constitute the small-scale model drawn from all the pupils of the subdivision of Lubumbashi I who form together the universe of investigation (the population mother).

2.2 Statistical analysis

The asked questions offered to the respondents a choice of answers of which the number varied from four to six. The averages obtained were subjected to univariate varience analysis (ANOVA) with statistical software XLSTAT-Pro7.5.The independent variables were the studied variables and the choice of the scientific option to humanities constituted the dependent variable.

3. Results and Discussion

The results relating to the training area of the survey carried out near 38 teachers responsible for the course for the physical sciences and technology are included in table 2 below.

Table 2: Training area of teachers

Traning Fields	Options	Frequence	%
Applied pedagogy	Chemestry-physics	3	7,89
	Biology-chemestry	9	23,68
	Mathématics-physics	5	13,16
Medecine	Human	2	5,26
Faculty of sciences	Pure chemistry	3	7,89
polytechnique	Indistrial chemistry	10	26,32
	Métallurgy	5	13,16
agronomic Sciences	Foodstuffs chemistry	1	2,64
Total		38	100

The question concerning the training area was put to determine the number of qualified and not qualified teachers sample. The reading of table 2 shows that 17 out of 38 sampled teachers, that is 44,73% only teachers are qualified and the remaining number constitutes the list of the under-qualified teachers. More than half of our sample would not ensure the teaching practices by formation but by nature and difficulties of the economic situation.

It should also be announced that 3 out of 17 qualified teachers, that is 17, 6% only are well placed to teach the course of sciences physics-technology for having known a rich career in the course of chemistry and of physics. These results corroborate those of KASANYA (2022) [6] which had also found that only 3 out of 17 teachers to teach the course of sciences physics-technology.

Table 3: Number of credits in university science courses

Nbre of crédits	chemistry		physics		Chemistry and physics	
	frequence	%	Frequence	%	fréquence	%
0-1	0	0	0	0	0	0
1-2	5	29,4	9	53	14	82,4
2-3	0	0	0	0	0	0
3-10	0	0	0	0	0	0
More than 10	12	70,6	8	47	3	17,6
Total	17	100	17	100	17	100

According to results' of the table 3 of the survey carried out near 17 teachers having made the TTCE, only 17,6% of the full-time teaching staff of a course of the physical sciences and technology with the FCBE (7th and 8th years) followed at least six courses of chemistry and physics after the secondary studies. The teachers having made the option mathematics-physics for example followed only 45h of chemistry (that is 1,8 credits of university courses in chemistry) and those having made the option Biology-Chemistry followed only 60h of physics (or 2,4 appropriations of university courses in physics) throughout their university course. The results concerning specialization in sciences corroborate those of Dussault (1988) [2] which also obtained a small percentage (17% of the teachers) within the framework of the second international investigation on the teaching of mathematics and sciences to Canada and those of (Lacasse and all, 1990) [8] which had found that less than a quarter of the teachers of 7th and 8th years responsible for the teaching of sciences in Canada had a specialization in these fields. Whereas to the secondary more than 60 % of the teachers responsible for a course for chemistry or physics followed more than 45 appropriations of university courses in sciences (Service National de Formation, 2019) [15]. The schools of the DRC in general and Lubumbashi in particular should adopt procedure of the classes of 7th and 8th years which would approach more the secondary system (of humanities) than that of the primary education system by aiming at the specialization of the teachers of these kinds.

Table 4: Proportion of program content taught

Proportion of program content taught	Frequence	%
all the chemistry and physics contents have been taught	29	17
Only chemistry contents have been taught	86	50,6
Only physical contents have been taught	45	26,4
More than half of the chemistry and physics contents have been taught	4	2,4
Half or almost half of the chemistry and physics contents have been taught	1	0,6
More than quarter of the chemistry and physics contents have been taught	2	1,2
The half of the chemistry and physics contents have been taught	1	0,6
Less than quarter of the chemistry and physics contents have been taught	2	1,2
None of the chemistry and physics contents has been taught	0	0
Total	170	100

The Table 4 has the results relating to the proportions of the contents of the program which were taught by the teachers having made the TTCE.

This reveals that only 17% pupils studied all the contents of chemistry and physics defined in the programs of 7è and 8è years of basic education. That could be explained by the fact that the teachers having followed less than 2 university credits of chemistry encounter difficulties in teaching the contents of chemistry correctly, even things retated to the contents of physics. We released a relation between the specialization of the teachers and the contents of taught chemistry or physique [$F(3,2888)=8,0$; $p<0,001$].

The teachers having followed more than 10 university credits in chemistry and physics manage indeed to teach all the contents of chemistry and physics defined in the programs. This report is identical to that of KASANYA (2022) [6] which had found that in the control of all the disciplinary knowledge defined in the programs of 7th and 8th of basic education, the rate of success had not exceeded 37%.The disciplinary essential knowledge being the ingredients necessary for the

treatment of the situations and the development of competences, only 17% of pupils would be able to develop the competences defined by the programs for in a school context, the suggested situations must make it possible to the pupils to use resources which concern the essential knowledge of the disciplines (Programmes éducatifs du Domaine d'Apprentissage des Sciences, classes de 7ème et 8ème années de l'Education de Base, Sous-domaine d'apprentissage, 2018) [14].

Table 5: The hope of choosing the scientific option

The hope of choosing the scientific option	Frequence	%
Yes	**33**	**19,4**
No	**137**	**80,6**
Total	170	100

Table 5 shows the results relating to the pupils who hope to make the scientific option with humanities. This reveals that only 19, 4 % of pupils voluntarily hope to choose the scientific option with humanities, that could be explained by the small proportion of pupils which correctly study the contents of chemistry and those of physics registered with the programs and being able to serve as the prerequis with the assimilation of the knowledge defined in the programs of humanities in the scientific option. These results corroborate those of Kamfwa (2022) [5] which had found that many girls were found in the scientific option by the influence of the parents or the friends, themselves do not have the will to make sciences at secondary (at humanities).

Table 6: Degree of love for science

Degree of love for science	**Frequence**	**%**
I like well science	32	18,8
I don't like sciences	15	8,8
I like physics	42	24,7
I don't like physics	8	4,7
I like chemestry	70	41,2
I don't like chemestry	3	1,8
Total	170	100

Table 6 has the results of the pupils who like sciences (chemistry and physics).This reveals that:

- More than 40% of pupils like chemistry
- More than 20% of pupils like physics
- Only 18, 8% of pupils like sciences (chemistry and physics).That could be explained by the small proportion of professors qualified to teach the course of the physical sciences and being able to give to learning the taste to make sciences with humanities.

We releazed a relation between the perception that the pupils have of their level of love towards chemistry or the physics and the contents of chemistry or physics studied in physical sciences of the Final Cycle of basic Education (CTEB) [F(3,2874)=6,0; p<0,001]. The pupils who normally studied all the contents of the physical sciences say indeed to like sciences and to choose the scientific option with humanities. This report is identical to that of Meq (2002) [12] in Canada, who had found that learners who studied all the contents defined in the programs tended to choose the Faculty of Sciences.

Table 7: The importance of doing science

	Frequence	**%**
Yes	**31**	**18,2**
No	**139**	**81,8**
Total	170	100

The answers to the questions of the table7 indicate that 18,2% pupils of the Final Cycle of basic Education think that it is significant to make sciences.The more they attach importance to it, the more they choose the scientific option with humanities [F(3,2867)=10,2; p<0,0001]. Other studies of which those of the (Conseil économique du Canada, 1990; Meq; 2000 & Meq, 2001) [1, 10, 11] also underlined such a relation.

4. Conclusion

This study presents the situation of the teaching and the training of sciences (physics and chemistry) at the pupils of the Final Cycle of basic Education.

This article examines the impact of the specialization of the teachers responsible for the course for the physical sciences and technology formed in the TTCE on the development of basic competences and the choice of the scientific option to humanities by the pupils for 7th and 8th of basic education in the sub-division of Lubumbashi I**.**

The descriptive data drawn from the survey questionnaires show that only 17 out of 38 sampled teachers, that is 44,73% of teachers who made applied pedagogy and that only 3 out of 17 qualified teachers, that is 17,6% are well placed to teach the course of physics-technology sciences. The teachers having followed more than 10 university credits in chemistry and physics manage indeed to teach all the contents of chemistry and physics defined in the programs. It can also be released a relation between the perception that the pupils have of their level of love in towards chemistry or the physics and the contents of chemistry or physics studied in physical sciences of the Final Cycle of basic Education (CTEB) [F(3,2874)=6,0;p<0,001]. The pupils who normally studied all the contents of the physical sciences say indeed to like sciences and to choose the scientific option with humanities.

It should be stressed that the program of sciences of the CTEB describes in the field of training of sciences never achieved the unanimity, as well within the world of the education as of the political community. Indeed, the development of this program was done in a context highly politicized. The generalization of the programs in all the schools was carried out without meticulous evaluation of the state of the preconditions impossible to circumvent in terms of the regulatory texts, of reinforcement of the capacities of human resources and the infrastructures in order to guarantee the effectiveness awaited as well of the teaching personnel and administrative as learners, main beneficiaries of the reform. Without forgetting parents and other educational partners.

On the basis of our result, we could confirm that the teachers having made the department of chemistry-physics in majority are well placed to teach the course of physics-technology sciences in 7th and 8th year of basic education. May the Congolese government reserve the granting of the scholarships to stimulate the students to choose chemistry physics?

This article shows the impact of the specialization of the teachers responsible for the course for the physical sciences and technology formed in the TTCE on the choice of the scientific option to humanities by the pupils for 7th and 8th of basic education. It constitutes an orientation for the future researchers who should think of checking the specialization of the full-time teaching staff of the course of chemistry in the first 4 classes of scientific humanities.

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