

## **BIOLOGY TEXTBOOKS OF FRAUS PUBLISHING COMPANY AND THEIR TEXT DIFFICULTY**

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### **Abstract**

This article presents knowledge of the text difficulty evaluation of biology textbooks of Fraus publishing company . The text analysis was realized by my own methodology. Obtained results show that text difficulty is similar in studied textbooks – from 30.1 points to 34.16 points. It indicate these textbooks into the same scale of difficulty, characteristic for sixth grade of education.

### **Key words**

Biology textbooks, text difficulty, syntactic factor, semantic factor

### **Abstrakt**

V článku jsou obsaženy poznatky o hodnocení obtížnosti výkladového textu v učebnicích přírodopisu od nakladatelství Fraus. Analýza textu byla realizována dle vlastního postupu. Dosažené výsledky ukazují, že obtížnost textu je obnoba v knihách pro 6. až 9. ročník a dosahuje 30,1 bodu až 34,16 bodu. To ukazuje na skutečnost, že všechny knihy spadají do stejného pásma obtížnosti, charakteristického pro 6. ročník.

### **Klíčová slova**

Učebnice přírodopisu, obtížnost textu, syntaktický faktor, sémantický faktor

### **Introduction**

It is possible to mention that textbooks have remained the most important tools in the educational process. There are different publishing companies in the Czech Republic and produce many books and biology textbooks, too. Some of them are used in primary schools, other in further levels of education. A lot of teachers do not know what is the best biology textbook for their education. These ones of Scientia publishing company (1997, 1998, 2000, 2001) or Prodos publishing company (1998, 1999, 2000) are the most required. The quality of textbooks has been studied by experts in different countries (Olechowski 1995,

Ottich - Kowalczyk 1992, Shepardson - Pizzini 1991, Schmidt 1991) and in our country, too (Hrabí, 2003, Pluskal 1996, Průcha, 1984, 1997). The quality of text can be good or bad. But for example biology textbooks of Fraus publishing company have not been studied yet. That is why the aim of this article is to give knowledge of their text difficulty.

### **Material and methods**

The text difficulty was studied in biology textbooks for 6<sup>th</sup> till 9<sup>th</sup> grade of FRAUS publishing company (2003, 2005, 2006, 2007). Exact citations are written in the chapter Literature. Fifteen characteristics of text difficulty were examined. Ten samples of text from each biology textbook were selected, and each of them consisted of 100 or more words ( $\Sigma N$ ). Particular characteristics, their symbols, definitions, ways of calculation are written as follows:

T - text difficulty;  $T = T_s + T_p$  (points),

$T_s$  - syntactic factor;  $T_s = 0,1 \times \bar{V} \times \bar{U}$  (points),

$\bar{V}$  - average length of sentence (number of words),

$\bar{U}$  - syntactic complexity of sentence,

$T_p$  - semantic factor,

$$T_p = 100 \times \frac{\sum P}{\sum N} \times \frac{\frac{\sum P_1}{2} + 2\sum P_2 + \sum P_3 + \sum P_4}{\sum N}$$

$$\bar{V} = \frac{\sum N}{\sum V}$$

$$\bar{U} = \frac{\sum N}{\sum U}$$

$\Sigma N$  - number of words,

$\Sigma V$  - number of sentences,

$\Sigma P$  - number of substantives,

$\Sigma P_1$  - number of common terms,

$\Sigma P_2$  - number of scientific terms,

$\Sigma P_3$  - number of factual terms,

$\Sigma P_4$  - number of repeated terms,

$$i = 100 \times \frac{\Sigma P_2 + \Sigma P_3}{\Sigma N} - \text{coefficient of density of scientific and factual information (\%)},$$

$$h = 100 \times \frac{\Sigma P_2 + \Sigma P_3}{\Sigma P} - \text{coefficient of density of scientific and factual information (\%)},$$

$$o = \frac{\Sigma P_4}{\Sigma P} \times 100 - \text{coefficient of repeated tinformation (\%)}. \quad \text{Note: 'tinformation' is a typo in the original text.}$$

The text difficulty of particular biology textbooks was evaluated according to scale of the biology text difficulty:

sixth grade  $T = 31 - 34$  points

seventh grade  $T = 33 - 36$  points

eighths grade  $T = 35 - 38$  points

ninth grade  $T = 37 - 40$  points

## Results

Particular characteristics of the text difficulty are written in table 1.

Characteristics of the text difficulty in biology textbook for 6<sup>th</sup> grade are mentioned. Total number of studied words is 1071 and they form 102 sentences. Average density of one sentence achieves 10.5 words. The syntactic complexity of one sentence is 7.6 words. Total number of substantives is 394 and is formed by four categories – common terms, scientific terms, factual terms and repeated terms. Their numbers are 60, 280, 12 and 42. The value of syntactic factor is 7.98 points and semantic factor achieves 22.12 points. Coefficients of density

of information are 27.26 % and 74.11 %. Coefficient of repeated information reaches 10.66 %.

Total text difficulty achieves 30.1 points and it is possible to mention according to it and the scale of difficulty, that this biology textbook is not difficult for sixth grade of education.

Characteristics of the text difficulty in biology textbook for 7<sup>th</sup> grade are mentioned. Total number of studied words is 1053 and they form 98 sentences. Average density of one sentence achieves 10.74 words. The syntactic complexity of one sentence is 7.92 words. Total number of substantives is 401 and is formed by four categories – common terms, scientific terms, factual terms and repeated terms. Their numbers are 38, 301, 20 and 42. The value of syntactic factor is 8.51 points and semantic factor achieves 24.76 points. Coefficients of density of information are 30.48 % and 80.05 %. Coefficient of repeated information reaches 10.47 %.

Total text difficulty achieves 33.27 points and it is possible to mention according to it and the scale of difficulty, that this biology textbook is very easy for seventh grade of education.

Characteristics of the text difficulty in biology textbook for 8<sup>th</sup> grade are mentioned. Total number of studied words is 1120 and they form 110 sentences. Average density of one sentence achieves 10.18 words. The syntactic complexity of one sentence is 7.1 words. Total number of substantives is 321 and is formed by four categories – common terms, scientific terms, factual terms and repeated terms. Their numbers are 81, 321, 16 and 73. The value of syntactic factor is 7.23 points and semantic factor achieves 26.93 points. Coefficients of density of information are 30.09 % and 74.72 %. Coefficient of repeated information reaches 16.19 %.

Total text difficulty achieves 34.16 points and it is possible to mention according to it and the scale of difficulty, that this biology textbook is very easy for eighth grade of education.

Characteristics of the text difficulty in biology textbook for 9<sup>th</sup> grade are mentioned. Total number of studied words is 1084 and they form 89 sentences. Average density of one sentence achieves 12.18 words. The syntactic complexity of one sentence is 7.58 words. Total number of substantives is 429 and is formed by four categories – common terms, scientific terms, factual terms and repeated terms. Their numbers are 85, 276, 28 and 40. The value of syntactic factor is 9.23 points and semantic factor achieves 24.14 points. Coefficients of density

of information are 28.04 % and 70.86 %. Coefficient of repeated information reaches 9.32 %.

Total text difficulty achieves 33.37 points and it is possible to mention according to it and the scale of difficulty, that this biology textbook is very easy for ninth grade of education.

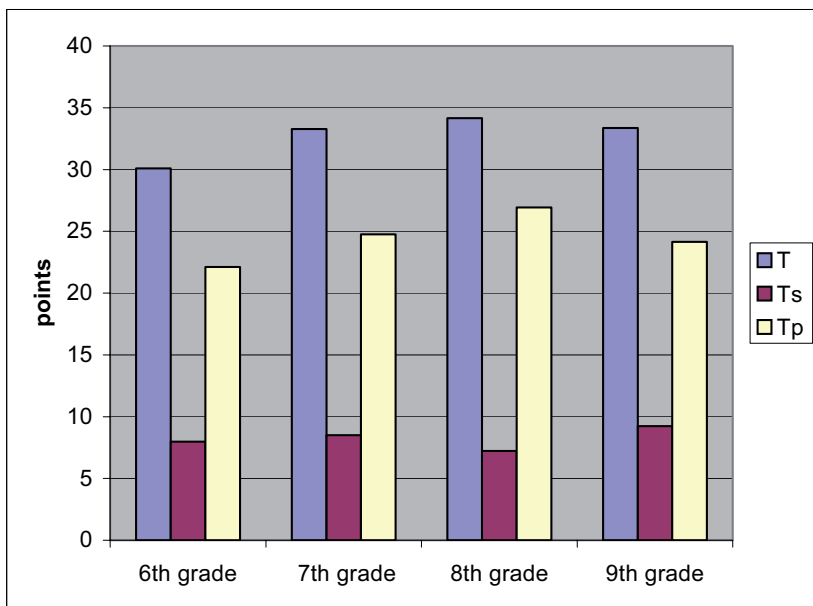
**Table1** Main characteristics of the text difficulty in biology textbooks of FRAUS publishing company

Characteristic	Grade of education			
	6 <sup>th</sup> grade	7 <sup>th</sup> grade	8 <sup>th</sup> grade	9 <sup>th</sup> grade
$\Sigma V$	102	98	110	89
$\Sigma N$	1071	1053	1120	1084
$\overline{V}$	10.5	10.74	10.18	12.18
$\overline{U}$	7.6	7.92	7.1	7.58
$\Sigma P_1$	60	38	81	85
$\Sigma P_2$	280	301	321	276
$\Sigma P_3$	12	20	16	28
$\Sigma P_4$	42	42	73	40
$\Sigma P$	394	401	451	429
Ts	7.98	8.51	7.23	9.23
Tp	22.12	24.76	26.93	24.14
T	30.1	33.27	34.16	33.37
i	27.26	30.48	30.09	28.04
h	74.11	80.05	74.72	70.86
o	10.66	10.47	16.19	9.32

Main components of the text difficulty are given in graph 1.

Achieved results demonstrate, that text difficulty increases very slowly from 6<sup>th</sup> to 8<sup>th</sup> grade (from 30 to 34 points). The value of text difficulty of biology textbook for ninth grade is similar to this one for 7<sup>th</sup> grade (33 points). Values of syntactic factor do not differ very much (from 7 to 9 points). Values of semantic factor achieve from 22 to 27 points.

**Graph 1** Values of the text difficulty (T), syntactic factor ( $T_s$ ) and semantic factor ( $T_p$ ) in biology textbooks of FRAUS publishing company



## Conclusion

This article contains knowledge about evaluation of the text difficulty of four biology textbooks of Fraus publishing company. Results indicate that text difficulty increases very slowly from 6<sup>th</sup> to 8<sup>th</sup> grade (from 30 to 34 points). The textbook for 9<sup>th</sup> grade shows lower difficulty level (33 points). According to the scale of difficulty, studied biology textbooks belong to level suitable for 6<sup>th</sup> grade. The text difficulty of biology textbooks for 7<sup>th</sup> till 9<sup>th</sup> grade should be higher.

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