Variant Texts According to Types of Sensory Perception

Milan Pastyřík, Petr Škuta, Ondřej Takács, Aleš Oujezdský
Department of Information and Communication Technologies, Pedagogical Faculty,
University of Ostrava, Fráni Šrámka 3, Ostrava-Mariánské Hory, Czech Republic
{ondrej.takacs; ales.oujezdsky}@osu.cz, {d15476, d15477}@student.osu.cz

Abstract

The paper deals with a problematic of creating variant texts according to a sensory perception. An idea of transcribing text is based on a theory of adaptive learning, which is thoroughly studied at the Department of Information and Communication Technologies. Researchers in this work combined the adaptive approach together with thinking styles introduced by Libor Činka and created four variants of texts of the chosen topics. Then those texts undergone the verification by the students from high school and university, who read them and evaluated them as well as they answered to a prepared set of testing questions. All received data was compared against the replies from the learning style questionnaires VARK and questionnaire by Šimíčková. The paper discovered some differences between the results of VARK and Šimíčková questionnaire, which proved to be slightly more reliable compared to both the results of test questions and the students' own opinion. There were also differences between sensory variants of texts. As expected, the kinesthetic variant proved to be the less effective compared to the rest. It seems that university students accepted the rewritten texts better than high school students too.

Keywords

Variant texts, types of sensory perception, learning style, adaptive instruction.

Introduction

The theory of adaptive learning is being developed at Department of Information and Communication Technologies for last several years. The Barborka4 system was created for the realization of experiments of adaptive teaching. In the beginning of the adaptive education the students start with a questionnaire that measures their learning styles and other characteristics that affect their learning. The aim is to achieve more efficient learning of students and deeper understanding and remembering of information during the education process. (Kostolányová, 2016)

The background of the student population in any university is very diverse. This includes varied socio-economic background, wide ranging ages of students, varied cultural background, prior educational experiences, levels of competency and preparedness, and preferred learning strategies. (Meehan-Andrew, 2009) Effective teaching in such a set up can be difficult and challenging. Teaching is a process of knowledge presentation while learning is often multifactorial and depends on the mindset of each student. (Drago, Wagner, 2004)

Neil Fleming in his landmark article 'I'm different; not dumb: Modes of presentation (V.A.R.K.) in the tertiary classroom' says that people learn in different ways using variety of strategies to convert the educational message into their long term memories. (Prithishkumar, 2014) There is no single best way to teach, but teachers can diversify their teaching styles to cater to the learning styles of each distinctive student. (Becker, 2007) Awareness of learning styles will help educators identify and solve learning problems among students. (Baykan, 2007)

An interesting stimulus for the research was the idea of Libor Činka, who argues that the preferred way of thinking (which can also be understood as a preferred learning style and can be determined on a basis of a questionnaire) in a speech reflected by the frequent occurrence of words associated with the thinking of either visual or auditory, or kinesthetic. You can meet the people who think quite strong in one sense only rarely. A situation where you have to be very attentive in order to identify the preferred way of the speaker's thinking is more common. It is because the language of the speaker contains not always clear identification of the words in his preferred way of thinking.

To test this idea, the four different texts were selected and these texts had no connection to the students' field of study. These texts were subsequently rewritten using the words which Činka has assigned a preferred way of thinking. The questionnaires that are used to detect learning style were also include in the research.

Basic research questions were:

- Can you formulate the text itself according to the learning styles?
- In which way?
- Will this modified text be more understandable and enjoyable for the readers?
- Will the reader with the preferred visual style of thinking be able to remember more due to rewritten and revised text?
- Will the text be easier to read for him? Will it be better understandable?

To fulfill these questions, the choice of proper text was made. Then the texts were rewritten to all sense variants and the time-consuming data collecting started including filling in the questionnaires and testing the texts by students who were reading them. The evaluation of this research brought interesting results.

Sensory Analysis

A group of properties called Sensory Perception describes which form of information students are most comfortable with. The sensory perception in the system Barborka4 is determined by a questionnaire, whose authors are Fleming and Mills (Fleming, 1992), and is also determined by other testing questions from Žáčková (1999) later on modified by Šimíčková. Both

questionnaires try to capture to what extent the students' senses are represented by the different types of sensory perception; verbal, visual, auditory and kinesthetic. Based upon the type of sensory perception the study material is adapted. A positive impact on the rate of learning during the use of adaptive teaching has been confirmed in several dissertations.

Both questionnaires VARK (Murphy, 2014), Šimíčková will be used in order to discover how they both differ in the way of identifying of preferred learning style and to determine how much their data will be similar.

In this research the students completed both questionnaires. After that they were familiarized with the characteristics of each type of sensory perception. Then they should try to determine to which extent they think they have the dominant types of sensory perception. In the conclusion, the results from VARK, Šimíčková and students' opinion will be compared.

The types of sensory perception in the text - the language of the senses

According to Činka (2012), a type of sensory perception in speech is reflected by the frequent occurrence of words associated with the thinking of either visual or auditory, or kinesthetic. Only rarely you can meet people who think strongly in one way. More common is a situation where you have to be very attentive to the preferred type of sensory perception. It cannot be identified, because speaker's language is not always clear in the first hearing and identification of a preferred way of thinking may be misinterpreted.

Visual types frequently used sayings:

- "I do not see any sense."
- "It is clear what you want to show us."
- "Let me show you my vision."
- "I do not see the sense."
- "Let me clarify this idea."

For visual types are important the tables, graphs, sketches.

Auditory types rather hear say:

- "I think it was absolutely consistent."
- "Do I hear you well?"
- "Tell me more."
- "Sounds great!"
- "Let's discuss."

Auditory people respond best to the instructions and information expressed verbally considering written messages or instructions to be less important.

Kinesthetic types express more feelings and emotions:

- "I do not know why it is exciting."
- "I understand how you feel."

- "You hit the nail on the head."

- "You need to fight with that."

- "I'm in a terrible stress."

Based on the above characteristics Činka created a table of words that represent different types of sensory perception, i.e. the language of senses. Red words represent a visual, auditory a blue, green a kinesthetic and black a neutral (see Fig. 1, in Czech).

vidět	myslet	oznámit	znát	odkrýt	obtížný	pamatovat	drsný
aspekt	rozhodnout	volat	vliv	oko	aktivní	vědět	pochopit
iluze	ječet	soudit	klepy	okruh	nutit	nesouhlasím	pevný
grafický	hovořit	hodnotit	klapnout	vymezit	narazit	panický	rozeznávat
ilustrovat	hluk	harmonie	konstatovat	obraz	mnout	napadnout	uznávat
malovat	hlasitý	formulovat	naladit	krátkozraký	emocionální	řídit	navštěvovat
odhalit	jevit se	meditovat	jasný	načrtnout	chladný	chopit se	proces
slyšet	image	vědomý	blýsknout se	dotazovat	citlivý	držet	učit
akcent	nápadný	dívat se	pestrý	doslech	brousit	povolit	dráždit
alarmovat	věřit	barvy	vyzkoušet	výmluvný	bolavý	motivovat	dotknout se
bouřlivý	řešit	horizont	připravit	diskutovat	bezcitný	rozumět	dojatý

Fig. 1: Words of sensory perception (Činka, 2012, in Czech)

Design of the research

We decided to test the theory of words of sensory perception in practice. We conducted a selection of four texts of different topics that we rewrote using words of sensory perception. The four variants were created (verbal, auditory, kinesthetic, auditory) for each text. Then we let the students read them. A student read four texts that were thematically and sensory variant different that every student has worked with four variants and four themes. After reading them each student completed a questionnaire with knowledge questions from the text and further questions regarding how he read the text and how he understood it. Each respondent also completed in the time span of about one month the questionnaires to determine the learning style VARK and Šimíčková version. The validity and reliability of VARK questionnaire was determined in earlier research (Leite, 2010, Fitkov-Norris, 2015, Thepsatitporn, 2016). After completing all these questionnaires, the processing and evaluation questionnaires followed.

The research group

The research sample consisted of 35 respondents. The 14 students were from high school and 21 university students of Information and communication technology in education.

Selection and processing of variant texts

The chosen texts had no connection to the field of study of all students. The topics were not covered neither on high school nor university. Table. 1 describes the content of selected texts.

| Topic No. 1

Blood Groups | Text deals with the discovery of different blood groups, their history and influence on catering for different types of blood groups. |

Topic No. 2 Lord of Lightning	Very short biography of Nicola Tesla's life and inventions.
Topic No. 3 Pond in the Garden	Describes the process of building a pond in the garden. By digging a trench through the film location, making the pond after placing a pump and filter.
Topic No. 4 Golden Ratio	The construction of the golden section in mathematics and its practical use in practice.

Tab. 1: Text topics

Respondents completed the two electronic questionnaires for the purpose of learning (codename RVAK, ŠIMI2) and read four texts on different subject and sensory perception. At the end, they filled in a questionnaire to read text.

Each topic was written on one side of an A4 sheet that it did not take a lot of time for reading the texts. The texts were rewritten using the words that according Činka represented some kind of sensory perception. Činka speaks about three types of variants of words - auditory, visual, and kinesthetic. The original text was considered a verbal variant. Here is an example of the following rewritten text of the "Lord of Lightning." Colored words are transposed ones (the translation from the Czech):

Verbal variant - the original text:

"Nikola Tesla, who at the peak of his career earned the nickname the Lord of Lightning, was born during the storm. It happened on the night of 9 to 10 July 1856 in the Serbian village of Smiljan. Even as a child he had a great imagination and an excellent memory. Gradually, he learned six languages, he studied mathematics and physics at the Universities of Graz in Austria, and Prague and Budapest and during the work in the telegraph company he began to deal with the principle of alternating current. "

Visual variant – the rewritten text:

"Nikola Tesla, who at the peak of his career was marked as the Lord of Lightning, was born symbolically during the storm. It happened on the night of 9 to 10 July 1856 in the Serbian village of Smiljan. Even as a child he was distinguished by a great imagination and an excellent memory. Gradually, he learned colorful set of six languages, he studied mathematics and physics at the Universities of Graz in Austria, and Prague and Budapest and during the work in the telegraph company he began to clarify the principle of alternating current. "

Auditory variant – the rewritten text:

"Nikola Tesla, who at the peak of his career was called the Lord of Lightning, was born during the storm. It happened on the night of 9 to 10 July 1856 in the Serbian village of Smiljan. Even as a child he had a great imagination and an excellent memory. Gradually, he learned six languages, he studied mathematics and physics at the Universities of Graz in Austria, and

Prague and Budapest and during the work in the telegraph company he began to deal with the principle of alternating current. "

Kinesthetic variant – the rewritten text:

"Nikola Tesla, who at the peak of his career earned the nickname the Lord of Lightning, was born during the storm. It happened on the night of 9 to 10 July 1856 in the Serbian village of Smiljan. Even as a child he had a great imagination and an excellent memory. Gradually, he learned six languages, he studied mathematics and physics at the Universities of Graz in Austria, and Prague and Budapest and during the work in the telegraph company he focused on the principle of alternating current. "

In this way, all the texts were transcribed in all selected topics.

Questionnaire design

For each topic, a questionnaire was created which tested the level of acquired knowledge. Furthermore, the questionnaire contained three questions on the interest, attraction and clarity of the text. These three questions were the same in all texts:

- How much interesting this topic was?
- How much clear the text was?
- How much have you enjoyed reading this text?

See a questionnaire bellow (in Czech).

Otázky

1. Kde se narodil Nikola Tesla? (označte x u všech správných odpovědí)
   - **Rakousko**
   - **Chorvatsko**
   - **Srbsko**
   - **Amerika**

2. Jak dopadla dohoda mezi Teslou a Edisonem? (vypište)

3. Vyberte technologie a vynálezy spojované s Teslou (označte x u všech správných odpovědí)
   - **Žárovka**
   - **Střídavý proud**
   - **Asynchronní elektromotor**
   - **Stejnosměrný proud**

4. Jak se jmenoval tajemný Teslův vynález a kdy byl sestrojen? (vypište)

Prosím, odpovězte ještě na následující otázky o tématu textu
(ohodnoťte známkou jako ve škole, 1 = nejvíce, ... 5 = nejméně)

1. Nakolik pro vás bylo toto téma zajímavé?
2. Nakolik byl pro vás tento text srozumitelný?
3. Jak moc Vás čtení tohoto textu bavilo?

Fig. 2: Questionnaire for text variant (in Czech)

Questionnaires on learning styles

Each respondent questionnaires also filled in a questionnaire to determine the learning style in addition to variant texts. There were two questionnaires filled out by respondents given at least two weeks' gap. Questions from both questionnaires are used in the system Barborka4 to identify the learning style of students:

- VARK - a questionnaire composed of 16 questions, used worldwide to determine the learning style. Each question offers the possibility of dealing with a particular situation in one of four styles (visual, auditory, verbal, kinesthetic). The respondent may choose more than one answer to a question. This questionnaire is also used for purposes of online education (Zapalska, 2006).

- Questionnaire from Šimíčková - contains 40 questions. Always 10 questions testing the specific learning style. The questions are worded notification sentence and respondent should determine how often to described life situation (often, sometimes, rarely).

After the questionnaire that respondents completed a set of another questions was added to determine what learning style are according to them after they have been displayed characteristics of different styles.

Process of reading texts and completing the questionnaires

Two months before the reading of variant texts the respondents filled in both questionnaires. Between both questionnaires there was at least two weeks' delay. After that the students came to read the four variant texts. Each of students read four different topics in four different variants, but four in total (the students had the different texts in different variants chosen randomly, but it was made sure that each of them had different sensory variant and not repeating topic). The reading all four texts took an hour in average.

Then the all data was gathered into the spreadsheet and evaluated.

Results – The learning styles

The graph no. 1 shows the comparison of results of two questionnaires on learning styles (VARK, Šimíčková) and opinions (NAZOR) of respondents. For comparison, the questionnaire was calculated as the percentage of identified style of each respondent. The graph shows the average proportion of learning styles of all respondents. There is a significant variation evident between visual and kinesthetic style in VARK questionnaire. Šimíčková version more corresponds to the views of respondents.
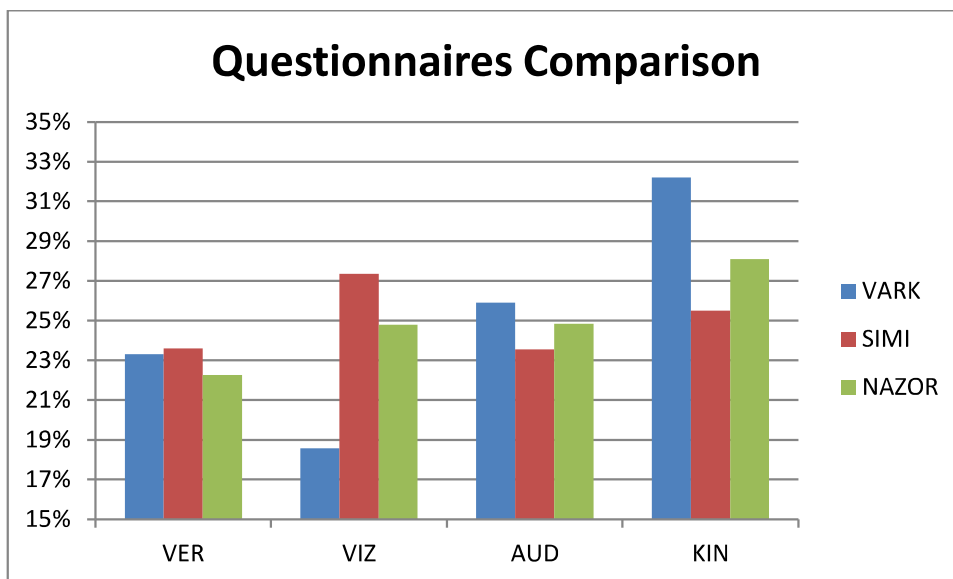
Graph 1: Questionnaires Comparison

Results - Knowledge after reading the text

The degree of knowledge gained from the read texts was calculated as the percentage of correct answers. The graph no. 2 shows that high school students (SŠ) have a lower success rate for all variants of the text. The smallest success has kinesthetic variant texts. It is possible to argue that the modification of the original text in sensory variant did not suit to high school students, but university students (VŠ) have proven some increase of knowledge in the rewritten texts variations.
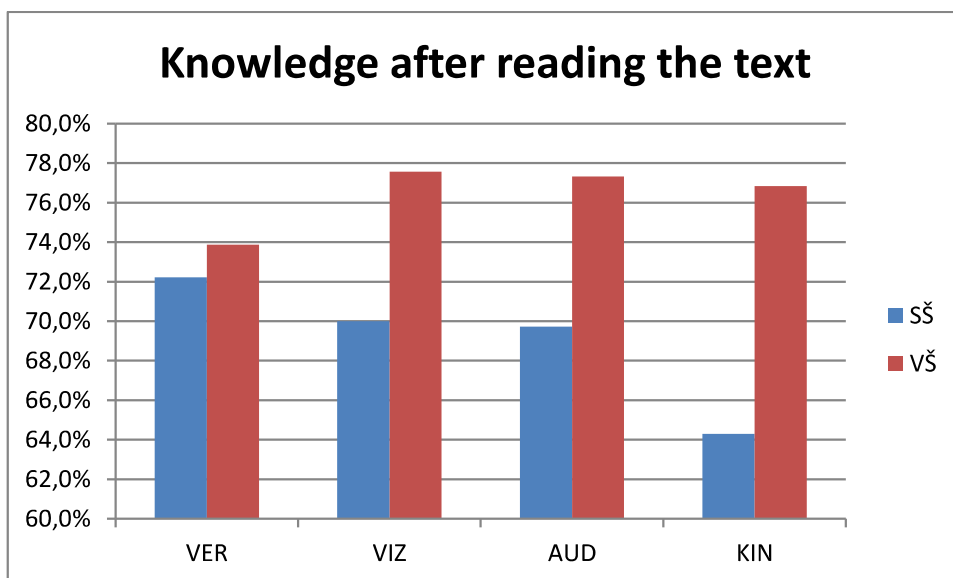
Graph 2: Knowledge after reading the text

The graph no. 3 shows the difference of knowledge among men (Muži, blue) and women (Ženy, red). Women seem to be better at verbal texts variations. Knowledge of men are higher in visual, auditory and kinesthetic variant texts.
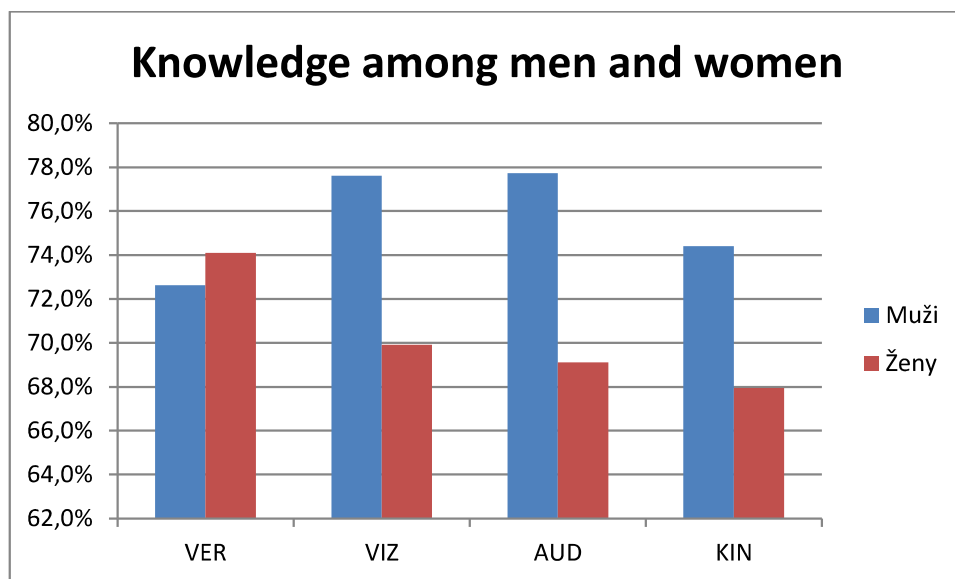

Graph 3: Knowledge among men and women

The table no. 2 shows the overall average students' knowledge according to variants and topics. There is not much difference in knowledge for each variant text. It seems that the modified texts do not significantly improve the percentage of acquired knowledge. On the other hand, the topic seems to be the factor changing the received knowledge.

Knowledge – Variants		Knowledge – Topics	
Verbal	73 %	Topic No. 1 Blood Groups	82 %
Visual	75 %	Topic No. 2 Lord of Lightning	81 %
Auditory	73 %	Topic No. 3 Pond in the Garden	71 %
Kinesthetic	71 %	Topic No. 4 Golden Ratio	59 %

**Tab 2:** Knowledge in Variants and Topics

Graph no. 3 displays the percentage of correct answers in a knowledge test by topics and texts variations. The most balanced versions are the original texts – verbal variant. There were higher results in knowledge of the rewritten texts at the topics 1 and 2. A significant negative impact had the auditory and kinesthetic variant of topic 4, which significantly decreased percentage of students who correctly answered the test questions.
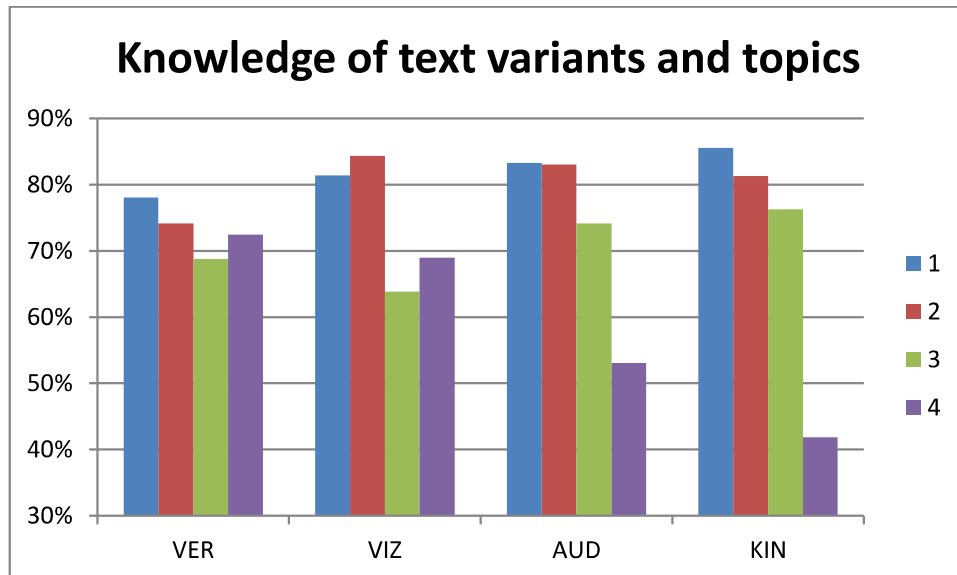

Graph 4: Knowledge of text variants and topics

Answers to the evaluation questions

The graph no. 4 shows the average number of points to the question: " How much interesting this topic was?" 0 points means the least, 4 the most. The most appreciated text was the Blood groups in all variants where in all variants the attraction grew a little. The following was the topic 2 the Lord of lightning, which was the most interesting in the visual variant. The remaining two topics were less attractive, where the worst ended the topic 4 in kinesthetic variant. The topic 3 "Pond in the Garden" was the most interesting for students in the kinesthetic variant. These results correlated to some extent with the results in the graph no. 3 and the text interestingness could be the cause of success in the knowledge test questions.
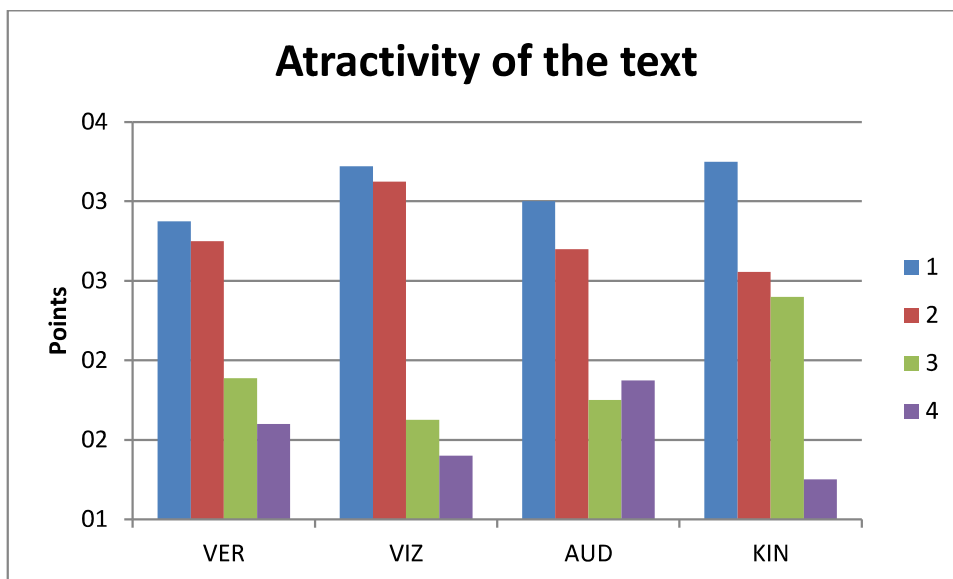
Graph 5: Attraction of the text

The graph no. 5 deals with the question: " How much clear the text was?" Here we see clearly that all the topics were clearest the most for the students in the original verbal variant with an exception of the kinesthetic topic 3, which the only seemed clearer than the original version.
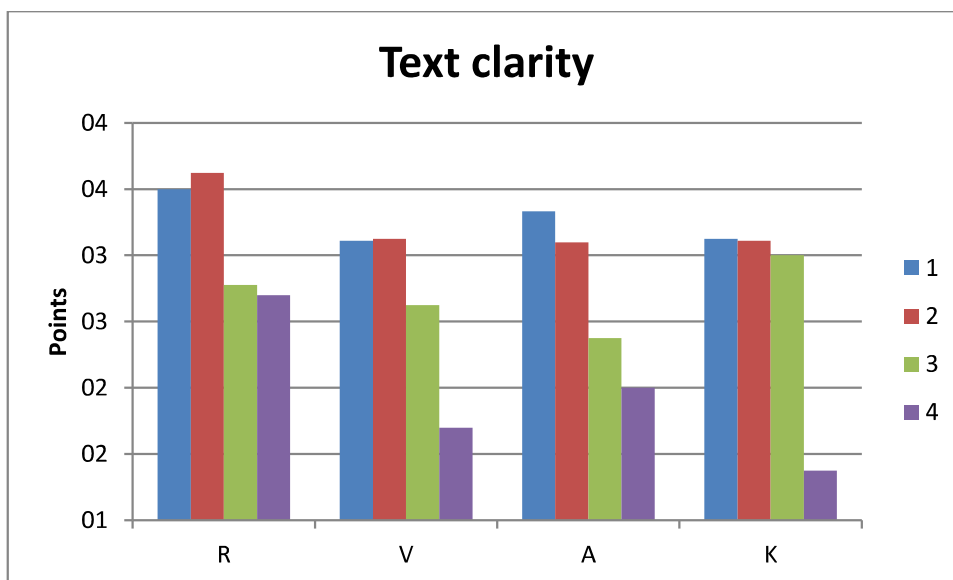
Graph 6: Text clarity

The rest of results is represented by the question " How much have you enjoyed reading this text?" in the graph no. 6. There has been an increase in an attractiveness from its original version in the topics 1 and 2. The most students enjoyed reading topic 2 in the visual variant and topic 1 in the kinesthetic variant. It seems that swapping sensory words can lead to greater attractiveness of the text.
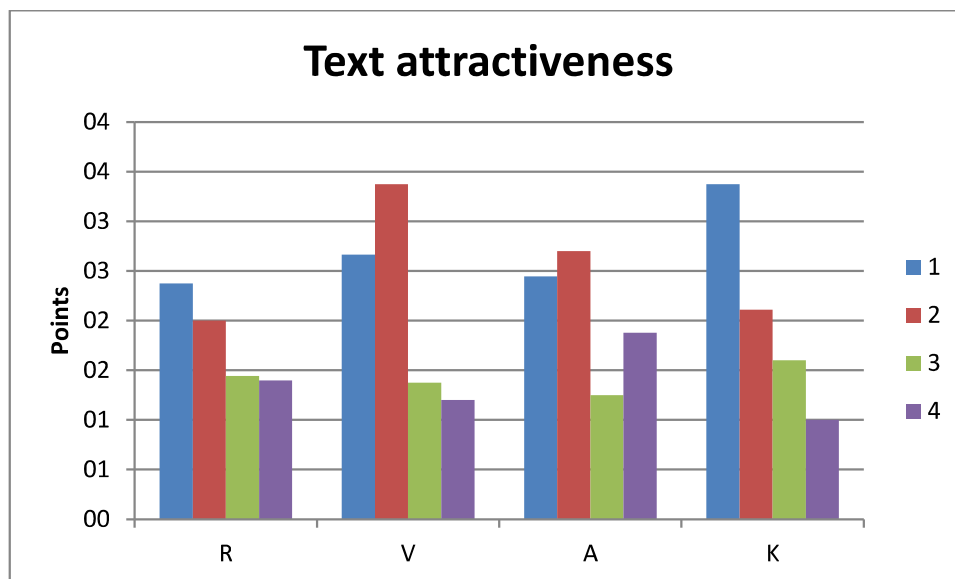
Graph 7: Text attractiveness

Percentage of the responses in variant texts due to the results of the VARK questionnaire

Now we compare how students have been successful in the knowledge test questions depending on what were the predominant learning style based on the VARK questionnaire. Table no. 3 is calculated the percentage of correct answers for those students who had the strongest learning style according to the test. The second column is the number of these students. The table does not represent all, since the four students were excluded who had two equally strong learning styles. Students with the identified dominant visual style of learning had the highest success rates in the verbal text and vice versa with the detected verbal style were more successful at visual text. For the auditory and kinesthetic styles were results equal. But it must be said that there was a small sample of students and differences in the proportion of correct answers are not much statistically significant, therefore we cannot generalize conclusion based on this results.

VARK questionnaire	The number of students	R	V	A	K
V	3	**90.0 %**	65.8 %	79.6 %	85.4 %
A	6	62.1 %	65.0 %	**70.2 %**	66.9 %
R	6	76.3 %	**81.7 %**	71.3 %	53.8 %
K	16	71.3 %	75.6 %	74.1 %	**76.1 %**

Tab 3: VARK and text variants

Conclusion

The paper describes the research, which was based on the idea of Libor Činka and his thoughts about the types of sensory perception in the text, because his division of sensory perception of the text is the same as learning styles, which is detected by the questionnaires VARK and questions by Šimíčková. We have redesigned according to the proposed procedures the four

different texts in the three sensory variants (visual, auditory, kinesthetic) and the original one was labeled as verbal. The research involved 35 students from the high school and university.

Firstly, students completed the questionnaires on learning styles. The results of the analysis of the findings of the questionnaires pointed out to a contradiction in the results of the questionnaire VARK and the opinions of students with visual and kinesthetic learning style. Questions by Šimíčková agreed more to a students' view of their own learning style (see graph 1).

Another area of the research was the memorized knowledge of the texts acquired by reading them. A significant difference between secondary school and university has shown, where the university students had a greater degree of knowledge in the modified variants of texts (see graph 2). If we take into account the overall performance in the level of knowledge, according to the sensory texts variation, the rewritten texts seem to not affect the acquired knowledge of students and all variants have the proportion of correct answers over 70 %. The difference between the smallest and the largest proportion of correct answers is 4 %. But it is different about at the topics of texts, where appeared a significant impact on their level of knowledge according to what topic the students read. The difference between the best and the worst percentage of correct answers is 23 % (see graph 4). Based on these results we cannot confirm the correctness of Činka's ideas and the memorization rate is primarily affected by the theme of the text than what words are used in the text.

According to the evaluation questions (subjective feelings of students on the interest, clarity and attractiveness of the texts) confirms previous findings on the rate of acquired knowledge and based on that we know that the least interesting, understandable and boring text has the lowest successful rate. But some impact of variant texts still can be observed. If the rewritten (V, A, K) and original texts are compared the interestingness and attractiveness have increased in average. On the contrary the clarity of rewritten text variations has fallen.

References

BAYKAN Z, Naçar M. *Learning styles of first-year medical students attending Erciyes University in Kayseri Turkey*. Adv Physiol Educ, 2007.

BECKER K, Kehoe J, Tennent B. *Impact of personalised learning styles on online delivery and assessment*. CWIS, 2007.

ČINKA, L. *Ovládněte svůj mozek: poslední kniha o mozku a zrychleném učení, kterou budete potřebovat*. Brno: BizBooks, 2012. ISBN 978-80-265-0022-3.

DRAGO WA, Wagner RJ. *VARK preferred learning styles and online education*. MRN, 2004.

FITKOV-NORRIS, E.D., Yeghiazarian, A. *Validation of VARK learning modalities questionnaire using Raseh analysis*. Journal of Physics, 2004.

GAVORA, P. a kol. *Elektronická učebnica pedagogického výskumu*. [online]. Bratislava : Univerzita Komenského, 2010. Dostupné na: http://www.e-metodologia.fedu.uniba.sk/ ISBN 978–80–223–2951–4.

Kostolányová, K. a J. Šarmanová. Adaptive Education Evaluation. In: DIVAI 2016: Conference on Distance Learning in Applied Informatics 2016 Štúrovo, Slovakia. Praha: Wolters Kluwer, 2016. Wolters Kluwer, 2016. s. 259-270. ISBN 978-80-7552-249-8.

Kostolányová, K. a Šarmanová, J. Individualisation and personalisation of education - modern trend of eLearning. International Journal of Continuing Engineering Education and Life-Long Learning. 2016, roč. 2016, č. 26, s. 90-104. ISSN 1560-4624.

LEITE, W.L., Svinicki, M., Shi, Y. *Attempted validation of the scores of the VARK: Learning styles inventory with multitrait-multimethod confirmatory factor analysis models.* Educational and Psychological Measurement, 2010.

MEEHAN-ANDREWS TA. *Teaching mode efficiency and learning preferences of first year nursing students.* Nurse Educ Today, 2009.

MURPHY, R.J., Gray, S.A., Straja, S.R., Bogert, M.C. *Student learning preferences and teaching implications.* Journal of dental education, 2004.

PRITHISHKUMAR I J, Michael S A. *Understanding your student: Using the VARK model.* J Postgrad Med, 2014.

THEPSATITPORN, S., Pichitpornchai, C. *Visual event-related potential studies supporting the validity of VARK learning styles' visual and read/write learners.* Advances in Physiology Education, 2016.

ZAPALSKA, A., Brozik, D. *Learning styles and online education.* Campus-Wide Information Systems, 2006.

ŽÁČKOVÁ, Hana a Drahomíra JUCOVIČOVÁ. *Děti s odkladem školní docházky a jejich úspěšný start ve škole.* 5. vyd. Praha: D + H, 2007. ISBN 978-80-903869-3-8.