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# Conceptual mapping from the point of view of the development of learning process effectiveness

Gabriela Petrová[*], Nina Kozárová[†]

***Abstract***

The paper is concerned with the issues of conceptual mapping in educational process. The conceptual map, as the visualisation of the system of knowledge, decreases the fear of failure for learners, since it helps not only in recalling knowledge, but can recode information into a form which is easier to remember. This is why conceptual maps support learning with comprehension and block learning by heart without understanding mutual relationships. Creating maps, learners are able to use interdisciplinary connections through which they remove isolated knowledge and modify structures of their inner knowledge system. Although during the study each learner uses a different strategy, in general it is assumed that conceptual mapping will be more suitable to the learners equipped with good visual imagination. The research was expected to prove whether a concrete learner´s learning style, applied during mental representation of the learning matter, influences the conceptualisation of knowledge reflected in the conceptual map.

*Keywords:*
Learning style
Mental mapping
Mental representation of learning matter
preconception

## 1 Introduction

Contemporary schools are in constant search for new ways in education, which would correspond with the needs of the European future. The teacher is not the only owner of truth, but a facilitator who should be helping learners during the process of the construction of their inner knowledge system. Therefore, it is up to the teacher to use the methods and procedures through which he/she will be able to develop, to a maximum possible degree, their personal potential. It involves a modification of learning situations so that the activity is always on the side of the learner.

By being active participants in educational process, learners create the structure of their knowledge and become designers of their own understanding. The inclusion of work with conceptual map to educational process therefore seems to be an initial step towards the improvement of creative thinking, since the mapping of main ideas supports the structuring of individual thinking processes.

## 2 Conceptual mapping

Constructivism, as one of the representatives of the innovative streams of cognitive-psychological theories, helps increase the active participation of learners in educational process. According to the conception, a learner knows how to think, reflects independently, and solves problems using the acquired knowledge. The

[*] Univerzita Konštantína Filozofa v Nitre, Tr. A. Hlinku 1, 949 74, Nitra.
*Corresponding author. E-mail:* gpetrova@ukf.sk

[†] Univerzita Konštantína Filozofa v Nitre, Tr. A. Hlinku 1, 949 74, Nitra.

pedagogical dictionary by J. Průcha- E. Walterová- J. Mareš (2001, s.105) characterised constructivism as: "a wide stream of theories in behavioural and social sciences, emphasising both the active role of the subject and the meaning of his/her inner preconceptions in pedagogical and psychological processes, as well as the importance of his/her interaction with the environment and society." Constructivism may be considered to be one of the ways of reflection on knowledge, since constructivists want to overcome the transmissivity of traditional teaching. The theory considers learners´ getting ready-made knowledge in the definitive form unacceptable.
Learners in our schools are not systematically trained to independently create the structure of their knowledge. Here the work with conceptual map seems to be helpful; it is characterised by T. Buzan (2011, s. 41) as follows: "The mental map is a pictorial expression of radial thinking. It is a process by which the human brain thinks and comes up with ideas. By their capturing and depiction, we create a mental map, an outside mirror reflecting what is happening inside our heads." The work with conceptual map is necessary for a human being, since the new as well as previously acquired information get sorted out in a natural way; moreover, in creating the map both brain hemispheres are involved, which contributes to a simpler remembering and more effective learning. The aim of the conceptual map is to create a structure of concepts. The structure thus created helps learners find out and verify the logical coherence of their individual interpretation of a certain thematic unit.

# 3 Relationship between the learning style and the conceptualisation of learner´s knowledge

The main aim of the research was to identify the relation (relation level) between the preference of the learner´s learning style and the mental representation of the learning matter through conceptual maps. Drawing on the aim of the research, the following research problem and hypothesis were stated:

1. Research problem:
   *What is the relation between the preference of the learning style (auditive/visual, kinaesthetic, tactile) and the conceptualisation of the learners´ knowledge in the teaching subject History*.

The given research problem results in the following hypothesis:
**H 1:** It is assumed that a concrete learning style applied during the mental representation of learning matter influences the conceptualisation of knowledge reflected in the conceptual map.

## 3.1 Analysis of research results

The selection set was composed by the pupils of secondary schools and secondary grammar schools. The research sample consisted of four mixed classes, 115 respondents in total. The *LSI questionnaire* by R. Dunn, K. Dunn and G. E. Price was used to analyse the learners´ learning styles. The answers were within five-degree scale, in which the degrees from one to five represented the range from absolute disagreement to absolute agreement. The acquired data were processed through the recoding of individual elements, in order to clearly formulate whether the given factor *0-* is *not preferred,* or *1- preferred* by the learner. The creation of semantic networks has remained an unexplained process up to the present. In the interpretation of the conceptualisation of learners´ knowledge we used the conceptual map test, since maps are an instrument which can help learners to clearly construe the learning matter, because they contain various schemes in space, relationships, key words, combinations of main ideas. As a key criterion in the conceptual map test scoring was used the map consistency, by which we understood the quality of the conceptual map created by the learner. What was important was the conceptual map´s general appearance, number of depicted relations, topicality of learning matters recorded in the map, mapping of elementary and extended learning matter. The map´s consistency was scored by means of 1-10 points, with 1 representing the lowest number of achieved points, 10 the highest number.

## 3.2 Interpretation of research findings

The research area was aimed at a relational research problem, therefore the chi-square test of independence was used to process the research findings. The following conclusions were arrived at:
*With the H 1 set hypothesis:* We assume that a concrete learning style applied in the mental representation of the learning matter influences the conceptualisation of knowledge reflected in the conceptual map, two statistical attributes were observed; the informative idea of their dependence was achieved through the arrangement of the obtained data into a two-dimensional table. The head contained the variants of one attribute, while the legend the variants of the second attribute. In individual cells the frequency of combinations from the variants of both attributes was given. The given frequencies are called empirical (observed) counts and are labelled $\mathbf{e_{ij.}}$ (which means the empirical count in the i-line and j-column of the table). The last line represents the footings of empirical counts and the last column represents the line totals of empirical counts. The lower right corner contains grand total of the observations.
In the *Chi-square* test of independence used to prove the claims, the $\mathbf{H_0}$, hypothesis assumed that the observed attributes are independent, while the alternative $\mathbf{H_1}$ hypothesis then expected the dependency of the observed attributes. To prove whether the empirical counts are or are not in contradiction with the $H_0$ hypothesis on the independence of both attributes, it was necessary to construe the so-called expected counts $\mathbf{o_{ij}}$ **,** i.e. the frequencies which would appear in the table in case of the independence of the observed attributes. The testing criterion was calculated as follows:

$$\chi^2 = \sum \frac{(O-E)^2}{E}$$

If our calculated value were lower than the table value, the zero hypothesis would hold. In case of the calculated value being higher than the table value, the alternative hypothesis would hold.

**Table no. 1: Auditive/visual learning and the consistency of conceptual map**

| 13 a consist. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 2 |
| 1 | 4 | 12 | 9 | 14 | 12 | 18 | 15 | 12 | 6 | 11 | 113 |
| | 4 | 12 | 10 | 14 | 12 | 19 | 15 | 12 | 6 | 11 | 115 |

| Up to 6 | Above 6 | |
|---|---|---|
| 2 | 0 | 2 |
| 69 | 44 | 113 |
| 71 | 44 | 115 |
| do 6 | nad 6 | |
| 1.234783 | 0.765217 | |
| 69.76522 | 43.23478 | 0.261391 |

Attributes “auditive/visual learning” and “consistency” were independent. A table of empirical counts was made, showing that the counts are lower than 5. Therefore, the reduction of columns and lines of the table was done, with calculations of expected counts for the reduced table. The arrived at values were used to calculate the value of test criterion at 0.26. This value is lower than the table value (3.84). The test thus showed that there is no dependency between the observed attributes.

**Table no. 2: Tactile learning and consistency of conceptual map**

| 14 a consist. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 3 | 2 | 3 | 1 | 5 | 1 | 4 | 1 | 1 | 21 |
| 1 | 4 | 9 | 8 | 11 | 11 | 14 | 14 | 8 | 5 | 10 | 94 |
| | 4 | 12 | 10 | 14 | 12 | 19 | 15 | 12 | 6 | 11 | 115 |

| Up to 5 | Above 5 | |
|---|---|---|
| 9 | 12 | 21 |
| 43 | 51 | 94 |
| 52 | 63 | 115 |
| Up to 5 | Above 6 | |
| 12.96522 | 8.034783 | |
| 58.03478 | 35.96522 | 0.000258 |

Attributes "tactile learning" and "consistency" were independent. A table of empirical counts was made, showing that the counts are lower than 5. Therefore, the reduction of columns and lines of the table was done, with calculations of expected counts for the reduced table. The arrived at values were used to calculate the value of test criterion at 0.000258. This value is lower than the table value (3.84). The test thus showed that there is no dependency between the observed attributes.

**Table no. 3: Kinaesthetic learning and the consistency of conceptual map**

| 15 a consist. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 1 | 1 | 0 | 2 | 2 | 1 | 1 | 0 | 8 |
| 1 | 4 | 12 | 9 | 13 | 12 | 17 | 13 | 11 | 5 | 11 | 107 |
| | 4 | 12 | 10 | 14 | 12 | 19 | 15 | 12 | 6 | 11 | 115 |

| Up to 5 | Above 5 | |
|---|---|---|
| 2 | 6 | 8 |
| 50 | 57 | 107 |
| 52 | 63 | 115 |
| do 5 | nad 5 | |
| 4.93913 | 3.06087 | |
| 66.06087 | 40.93913 | 0.000121 |

Attributes "kinaesthetic learning" and "consistency" were independent. The table of empirical counts was made, showing that the counts are lower than 5. Therefore, the reduction of columns and lines of the table was done, with calculations of expected counts for the reduced table. The arrived at values were used to calculate the value of test criterion at 0.000121. This value is lower than the table value (3.84). The test thus showed that there is no dependency between the observed attributes.

Based on the results of individual tables (no. 1,2,3), it is possible to conclude that a concrete learning style applied at mental representation of the learning matter *does not influence* the conceptualisation of knowledge reflected in the conceptual map. As the observed variables were chosen individual learning styles of the learners, identified via the LSI questionnaire and the parameter of the operationalisation of the test of conceptual mapping: the consistency of the conceptual map.

## 4 Conclusion

By implementing conceptual mapping into the teaching process we try to make the teaching of the subject History more efficient. Conceptual map is a visual outcome of the way the human brain thinks. Since the learners were not given ready-made notes, but constructed their inner knowledge structure themselves, they were active participants during the entire teaching unit.

The entire thematic unit was made more understandable for them. This is the reason why we consider systematic training of learners to structure their semantic networks to be very important. When learners understand the learning matter, they are able to connect new knowledge with a previously acquired one, to work with it and to apply it in the everyday areas of their lives. This will change not only the quality of their knowledge, but also attitude to learning and to the chosen subject.

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