European Journal of Education Studies
ISSN: 2501 - 1111
ISSN-L: 2501 - 1111
Available on-line at: www.oapub.org/edu

doi: 10.5281/zenodo.2533260 Volume 5 | Issue 9 | 2019

MEASURING THE COGNITIVE STRUCTURE OF GFL (GERMAN FOREIGN LANGUAGE) HIGH AND LOW ACHIEVED STUDENTS AT THE FACULTY OF EDUCATION THROUGH WAT (WORD ASSOCIATION TEST)

Iman Abdelraouf Abdelhalim[i]
Lecturer of Educational Psychology,
Department of Educational Psychology,
Faculty of Education, Helwan University,
Egypt

Abstract:
The current research aims to determine the cognitive structure of GFL high and low achieved students. The researcher employed WAT (Word Association Test) on 26 students at the second level. An Achievement Test was used to define the GFL high and low achieved students. WAT (Word Association Test) was implemented to investigate the cognitive structure of the students. Qualitative and quantitative analyses of data were used. Implications for GFL teacher education were presented.

Keywords: cognitive structure, high and low achieved students, GFL (German as a foreign Language), WAT (Word Association Test)

1. Theoretical background

1.1 The role of cognitive structures in information processing ability

It has been an immense challenge to understand how learning takes place in human mind and this has been the subject of major research over the years. Knowing how a student thinks, how a new process of learning takes place in students' mind has always represented one of the greatest Puzzles for the researcher (Catarreira, Lopes, Carcia and Gonzalez, 2017).

The cognitive structure is very important term for successful education Nawaneedhan and Kamalanabhan (2017) indicated that cognitive structures are the basic mental pattern people use to process any information. Cognitive structures play an important role in the information processing ability of the learners as they serve as frames of reference, allow grasping and working with one or several aspects of concept; the information being linked to both generalization and synthesis has the potential for

[i] Correspondence: email imandeutsch@yahoo.com

both. It is however, a different mental process building new e structures to match and model the structures studied, with an emphasis on the relations between the objects of thought rather than a focus on the objects themselves. For example the student is required to focus the relationships that exist between an apple and an orange has to focus on the thinking that involves similarities and differences between them rather than focusing on the object.

The three basis steps involved in mental representation of the given information:

- The mental representation may be changed, adjusted to match the information to get desirable behavioral outcome.
- The mental representation does not change over a time meaning that the existing information persists.
- The new information is retained along with the retention of old mental representation from which it was built

Therefore, good and proper learning involves mental activity that is not purely intuitive but also cognitive dealing with an input solely reference the concept image in order to produce an output.

Catarreira, Lopes, Carcia and Gonzalez (2017) think it is essential to combine the study of cognitive structure with the student's learning process, which allows for a more complete view of the entire process and more effective intervention by the teacher or by the students themselves. Thus, leading to better outcomes. The characterization of student's knowledge about a particular content enables the identification of wrong connections in the student's cognitive structure and help to identify the absence of other connections that are considered essential in a particular field of knowledge.

The Term cognitive structure influences not only the educational level of People, but also the moral behavior of them. People represent knowledge about their self-concept in Terms of multiple cognitive structures or self-aspects. Self-overlap refers to the extent to which people perceive their various self-aspects as in interconnected, such that their thoughts and feelings about themselves as similar across these self-aspects (Toure- Tillery and Light, 2018).

1.2 Highlight the driving role of concept in teaching

It can be seen from the basic principles of cognitive psychology that the information processing needs the concept driving in addition to data driving. Contemporary American psychologists think that, the acquisition of new knowledge depends on the interaction of old knowledge and concept in the current structure and the addition of new knowledge to other original cognitive structure. Cognitive structure is directly added to the interaction with the new knowledge, which does not only decide whether the new learning ability is produced, but also ensures the migration of new knowledge in the new environment. In the learning process, there are two learning methods, one is the comprehension learning method and the other is the mechanical learning method. This kind of learning method can effectively understand the association between learning rules and learning concept of knowledge learned. The psychologists find the

comprehension method is a more effective learning method, which can make students master the relevant knowledge firmly (Liu, 2015).

1.3 Measuring of cognitive structure

Understanding how people think and how they organize knowledge are always major concerns for educators. They have various ways of representing the cognitive structure of learners. There are five methods representing cognitive structures as follows:

- Free word association;
- Controlled word association;
- Tree construction;
- Concept map;
- Flow map.

The exploration of cognitive structure can help teachers to know what their students have already in memory (Tsai and Huang, 2002).

Table 1: Aspects and Variables of cognitive Structures

Aspects	Variables
Concepts	Extent, Correctness
Connection	Integration
Information processing skills	Availability, Analysis of information, Processing strategies

As a result, these three aspects include five different variables, which are described as follows:

- extent: the number of ideas contained in the cognitive structure of someone.
- correctness: the number of alternative conception shown in cognitive structure or the number of correct conceptions.
- integration: the connection of cognitive structure. A well-organized structure is similar to a well-structured database. The user can find the information efficiently.
- availability and analysis of information processing strategies (Tsai and Huang, 2002)

A lot of previous studies concentrated on measuring and mapping the cognitive structure such as (Ersanli, 2016) this study aims to map the cognitive structure of pre-service teachers about three key concepts related to approaches and methods in language teaching. Another study aims to identify the cognitive structure of prospective preschool teachers concerning the concepts included in the subject (force and motion). The word association test was employed to reveal their cognitive structure (Timur, 2012). The study of Nakiboglu (2016) aims to investigate high school student's cognitive structures and to identify their learning difficulties in physical and chemical changes through word association test and to compare at different student's grades.

Murphey and Suen (2015) indicated that the complete measuring of structural Knowledge must be able to capture important domain **concepts**, the way the concepts are **interrelated** and the **strength of the relation**

1.4 Research questions

- Are there statistical significant differences between the cognitive structures of GFL high and low achieved students at the faculty of education about the ten given Concepts?
- Are there any misconnections for the high and low achieved students about the given concepts?
- What are the implications for GFL teacher education?

2. Method

The current research involves both, qualitative and quantitative data. The data was gathered buy WAT. By WAT, the researcher selected ten key words namely (Sprachwissenschaft, Aussprache, landskunde, literatur, Freunde, schule, Fahren, Dialog, Verben, krankheit) as key concepts. The researcher give the students a sheet of paper on which the ten key concepts were written, and asked them to write the related words for each concept and build a meaningful sentence for each concept. The students were also asked to draw the relation between the given concept and the related words.

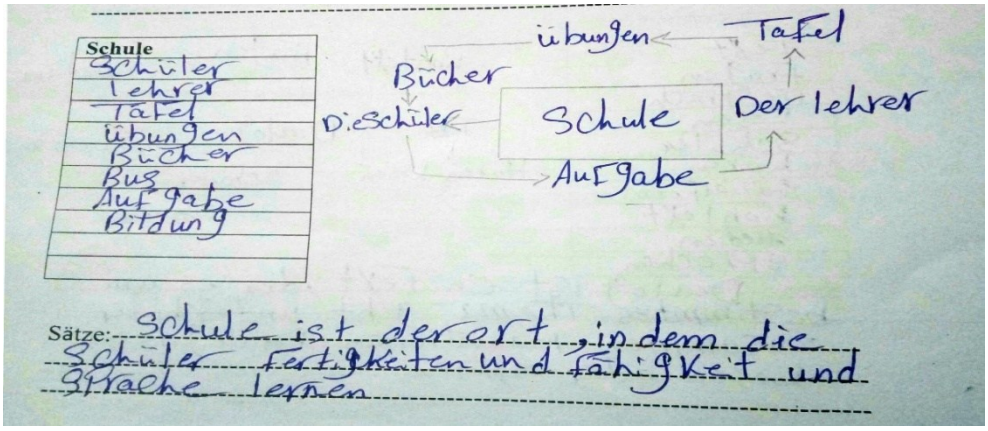
2.1 Participants

The study was conducted on a total 26 (20 female) and (6 male) studying German as a foreign language at the second level at the faculty of education during the first term of the educational year 2018 / 2019.

2.2 Data analysis

The researcher used WAT to determine the cognitive structure of GFL high and low achieved students. Each student was asked to write related words to given Key concepts and to build meaningful sentence to combine between key concept and related words. The researcher asked the students to draw concept map for each key concept.

Figure 1: Example of WAT of participant number 14



3. Results and findings

After applying of WAT the researcher has identified through WAT how many words were written for GFL high and low achieved students and how many words are connected to the key concept and what are the misconnected words.

Table 2: Number of written words and the connected words and the misconnected words of GFL high achieved students

Key concepts	Number of written Words	Number of connected Words	Number of misconnected Words
Sprachwissenschaft	78	76	2
Aussprache	85	72	13
Landskunde	89	89	0
Literatur	88	82	6
Freunde	89	88	1
Schule	106	101	5
Fahren	100	87	13
Dialog	86	81	5
Verben	104	50	54
Krankheit	101	97	4
Total	926	823	103

Table 3: Number of written words and the connected words and the misconnected words of GFL low achieved students

Key concepts	Number of written Words	Number of connected Words	Number of misconnected Words
Sprachwissenschaft	91	45	46
Aussprache	58	44	14
Landskunde	69	53	16
Literatur	61	40	21
Freunde	79	70	9
Schule	90	70	20
Fahren	104	77	27
Dialog	74	52	22
Verben	106	37	69
Krankheit	87	70	17
Total	819	558	216

The researcher used Manova to define the differences between GFL high and low achieved Students in cognitive structure and the components of cognitive structure.

Table 3: Mean and std. deviation of GFL high and low achieved students in the cognitive structure and its components

The cognitive structure components	Mean	Std. deviation
Extent	67.12	15.66
High achieved	71.08	18.39
Low achieved	63.10	11.79
Correctness	52.62	17.89
High achieved	61.85	18.46
Low achieved	43.38	11.89
Integration	13.81	5.76
High achieved	17.15	3.91
Low achieved	10.46	5.43
Sum	133.53	G35.40
High achieved	150.08	G37.46
Low achieved	117.00	G14.70

Table 4: Manova of GFL high and low achieved students in the cognitive structure and its components

Components of cognitive structure	Sum of squares	df	Mean square	F	Sig.	Eta squared
Extent	408.04	1	408.04	1.711	.203	.067
Correctness	2215.39	1	2215.39	9.194	.006	.277
Integration	291.12	1	291.12	13.013	.001	.352
Sum	7111.538	1	7111538	70.06	.014	.227

The table number (4) explained that there are statistical significant differences between GFL high and low achieved students in the total score of WAT that measures the cognitive structure.

There are statistical significant differences between high and low achieved students in correctness of written words and in Integration of concept and written words. But the result showed there are not statistical significant differences in the extent (the number of written words).

3.1 Qualitative analysis

The researcher asked the students to draw concept map and combine between given concepts and connected words. The students draw concept maps for each concept of ten given concepts.

Figure 2: Examples of WAT of GFL low achieved students

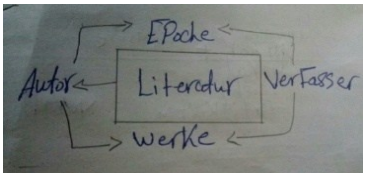
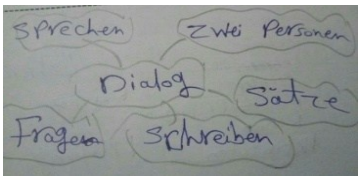
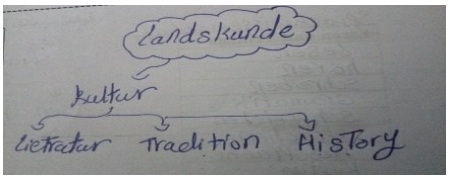
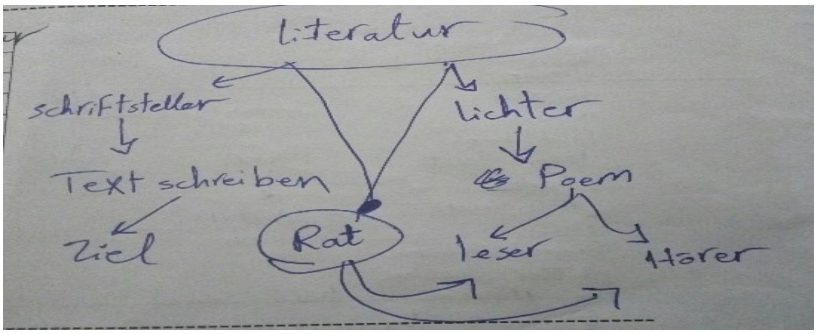
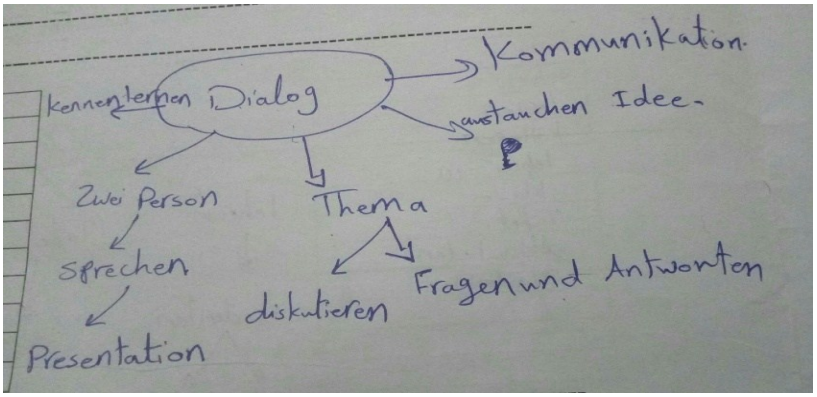
WAT of Participant 14	WAT of Participant 17	WAT of Participant 18
		

Figure 3: Examples of WAT of GFL high achieved students

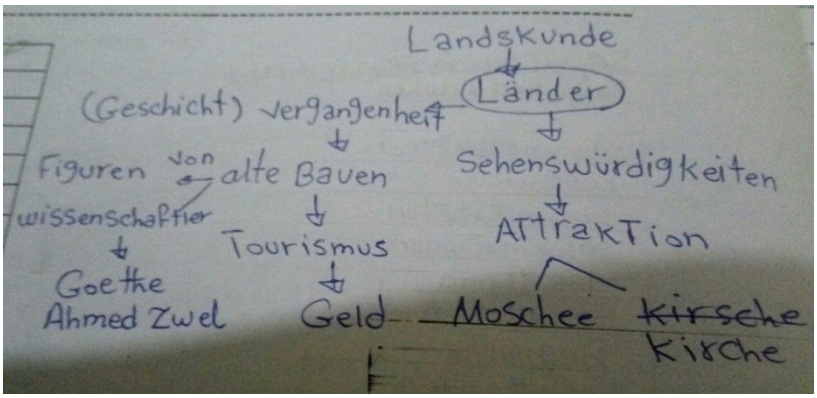
WAT of Participant number 6



WAT of Participant number 7



WAT of Participant number 8



From the concept maps of students, the following points can be showed:

- Some of concept maps are linear, the others are interactive. It related of the way of store the information in the memory.
- A lot of students write misconnected words on the concept (Verben). They can't define the connected words for this concept.
- Some students have disability by drawing concept maps, and the others can draw concept maps easily.

- Some students draw concept maps but has problem by determining the related Words in Germany. They think in Arabic and can't find in their mental lexicon Words which form their thinking.
- The number of concept maps of GFL high achieved students is more than the Number of concept maps of GFL low achieved students.

3.2 Implications for GFL teacher education

The successful education should take into consideration the importance of students' cognitive structures. By teaching the concept should the teacher combine this concept with other related concepts. Meaningful education considers the organizing of the information and the combination between old experiences and new experiences. It should consider student's brain as database which should be well organized and between stored elements connected. It should also meet the educational needs of students and define what the students need to learn.

Teaching the foreign language is differs from teaching of another disciplines such as Geography or History. The student should understand the unit of language. The elements of language complete each other. The aim is to use the language in the right way. There are no limits between the linguistic elements. Grammar, articulation, vocabulary and other elements should be considered by using the language. For example in dialog with someone should be given attention for all linguistic levels, syntactic, semantic and pragmatic.

Especially for the teacher of GFL should be taken that into consideration because the German language has many differences in the rules such as rule of singular and plural. In German, there is not one addition to transform the noun from singular to plural.

3.3 Recommendation and future studies

The term of cognitive structure is very important in the successful education. By teaching, the language should be taken into consideration the cognitive structure of students. That helps teachers to know how they can present the educational material and how they make lesson plans and how they can assess the educational level of learners.

It is recommended, cognitive structure in all subjects should be measured. And the relation between cognitive structure and psychological variables such of anxiety and depression can be identified. The effect of the term cognitive structure relates not only with knowledge or skills, but also attitudes of people.

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