Impact of Cognitive-Individual Variables on Process of Foreign Language Learning

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Abstract

The article deals with chosen determinants affecting the process of foreign language learning which are important for the teachers in the selection of suitable strategies and methods of learning. We investigate the influence of individual cognitive variables, individual variables and facto-graphical variables on the learning process, specially on syntactic skills in a foreign language. We used stepwise regression analysis to detect the impact of these determinants on syntactic skill of individual students. The remarkable and paradoxical finding was that the longer the student was studying English, the lower his/her syntactic skill was.

1. Introduction

The process of foreign language learning is usually influenced by many factors. The impact of variables in the process of foreign language learning covers a wide scale of various mental processes and other factors. These factors influence the quality of foreign language learning - automatisation, fixation, and anchoring in language structures and cultural specifications, which are then reflected in the fluency, productivity, flexibility and the natural sound of foreign language communication. Experts on psycholinguistics (Rickheit, Strohner & Sichelschmidt, 2007; Butzkamm, 2002; Rickeit & Deutsch, 2003; Field, 2004; Garmann, 1990; Kess, 1992 and others) focus on analysing the impact of individual determinants in the area of speech perception and reproduction. From the point of speech perception, the question is how individual people perceive speech, how they differentiate individual phonemes, syllables, morphemes, sentence parts or whole sentences and their meaning. Crucial questions relate to the characteristics of various levels of processing linguistic situations and their mutual interactions. In case of speech production, it is important to observe how thought contents are planned and designed, to be able to express them in the form of sentences. Consequently it is necessary to focus on the intention of communication and the motivation of the speaker, influences in the process of decoding - quality of input channel and level of knowledge; the analysis of communication processes from the point of spontaneity, grammatical accuracy, fluency, etc.

In our article, we focus on the impact of cognitive and individual variables in the process of foreign language learning. Cognitive variables are mainly represented by processes of perception, processing and producing...
information in a foreign language, and therefore, we consider them to be the crucial predispositions for foreign language acquisition.

2. Cognitive and individual variables

With cognitive and individual variables we mean variables such as the ability to create a cognitive structure and the need for structuring. We describe the characteristics of ability to create a cognitive structure as tolerance for uncertainty or the ability of optimal risk, ability to reduce a situation uncertainty, and ability of flexible reaction in an uncertain situation. It is a way how a person (or a group of people) can perceive and process information about uncertain stimuli and situations, or about situations that are considered uncertain or unexpected. This ability can be considered as a precondition for a successful handling of a situation. Bar - Tal (1999) sees cognitive structuring as an activity, a process which helps to achieve a certainty by filtering inadequate information, and claims that when a person processes information gradually, the information is assimilated in a cognitive structure and can be used subsequently. The construction of personal need for structuring is theoretically based on an assumption that the ability to reduce uncertainty of a situation is significantly connected with a higher ability to solve new or manage stressful situations. The need for structuring has a highly positive correlation with the preference of an abstract conceptualization, whereby in a strong need for structuring we can observe a very low preference for a so called active experimentation (the willingness to overcome one’s own limits, the willingness to change one’s own beliefs, ways of behaviour, attitudes, simple structures) (Sarmány Schuller, 1997, 1999), DeBonno and Snyder (1992, in Bar-Tal, Spitzer, 1999) found out that persistent individuals use a heuristic process without making any special effort, whereas sensitive individuals must make a big effort in this process.

We designate individual impacts or specific individual approaches as intrapersonal (personality) variables. In our article, we focus on the following variables: verbal intelligence, self-evaluation, cognitive style category width. The cognitive style observes individual preferences, differences in cognitive processes that include all processes on the basis of which knowledge is acquired: perception, imagination, memory, problem-solving, and thinking; and subsequently in attitudes, in grasping a problem and its solution. The cognitive style dimension “category width” relates to individual differences in width of categories that are conditioned by differences in the strategies of information processing. An extreme case - a wide categoriser - according to Pettigrew (1958, in Jurčová & Sarmány Schuller, 1993) achieves better results in those tasks in which he/she can use an integrated holistic strategy. A narrow categoriser is superior in those tasks in which a detailed or analytical information processing is required. The summarisation of research findings as well as researches of the C-W scale have shown that narrow categorisers, in general, tend to be careful, rigid, and have a high certainty in cognitive decision making (particularly men).

Verbal intelligence is expressed mainly by a language intuition, verbal creativity, etc. An individual, in the process of foreign language acquisition, processes an abstract foreign language structure, establishes a connection to the language, tries to analyse, deduce, and consequently makes a synthesis in the language. Based on these facts, an individual creates sentences, makes compound sentences, and establishes a language attitude or language intuition.

Gardner (1999) emphasizes mainly syntax or sentence composition in verbal intelligence. The aim of our research was therefore to study the ability to compose a sentence, the language intuition, language intelligence and connections with personal characteristics - the construction of need for structuring and the ability to achieve a cognitive structure (tolerance of uncertainty). Lightbown & Spada (1997) observed connections between language precursors and personal characteristics in a research. They claim that a research of this kind is very difficult to carry out because connections are hard to prove.

3. Data collection (cognitive and individual variables)

The aim of the research is to establish the level of syntactic skill dependence on individual variables observed, that means, to what extent the syntactic skill depends on cognitive and individual variables. The research was carried out within the APVV Project - Intervention Linguistic Programme at the Faculty of Education, Constantine
the Philosopher University in Nitra. 114 students of the study programme English Language and Culture took part in the research.

In the process of acquiring data, we used following research methods:

1. **AACS Scale** - Ability to Achieve Cognitive Structure which measures the ability to create a simple cognitive structure or the thought flexibility. With the help of the **AACS Scale** we observed how students reacted in an uncertain situation, in a foreign language communication; to what extent they are able to achieve certainty in foreign language communication, especially in processing morphological and syntactic differences of English language (morphology and syntax of the English language).

2. **PNS Scale** - Personal Need for Structure which arises from the assumption that the ability to reduce uncertainty of a situation is connected with managing new situations. The **PNS Scale** score is based on a two-factor conception of personal need for structure: a desire for structure (sub-factor F1) and a reaction on a missing structure (sub-factor F2). With the help of the **PNS Scale** we observed, to what extent the need for structure and the reaction on a missing structure are connected with foreign language structure, with English language syntax.

3. **Estimation Scale C-W (Category Width)** which measures the cognitive style category width and a real estimation. The tasks are not aimed at determining knowledge; they should reveal how students can estimate the answer to a given task.

4. **RSES Scale** (Rosenberg Self-Esteem Scale) which we used for tracking the levels of self-evaluation. We observed how and if, at all, the level of self-evaluation has an impact on the ability of an individual to produce speech acts in a foreign language.

5. **Intelligence Structure (Test I-S-T)** - The Intelligence Structure Test measures the overall level of intelligence and its structure. We focused on three subtests out of nine that measure verbal intelligence: subtest 1 - Sentence Supplementing (SS) – creating opinion, sense for reality, acquired level of thinking; subtest 2 – Word Choice (WC) – vocabulary, language attitude, discursive thinking in a language; subtest 3 – Analogy (AN) – understanding relations, combination ability, flexibility and variability in thinking. We observe to what extent they influence syntactic processing of a foreign language, the English language.

6. **Syntactic Skills** - Test which measures the ability to create syntactic structures, the ability to create sentence compositions in English, the perception of syntactic sentence structure, language intuition, creativity as well as flexibility.

### 4. Analysis of the impact of observed variables on syntactic skills

To state the impact of each observed factor (**VIQ, AACS, PNS, RSES, a-b, a+b, Morphology, Living abroad, Study-year**) on syntactic skills (**Syntax**) we applied stepwise regression analysis on data. Specifically, we used forward stepwise regression which enables individual adding of independent variables into the model in every step of regression (according to setting **F** to enter/ **F** to remove) till the moment when the best regression model is achieved.

We did not mean to achieve the best model but to estimate the contribution of individual observed independent variables to the variability explanation of the dependent variable **Syntax**. In this case, it was desirable to get all or almost all variables in the forward stepwise regression into the model.

**Table 1. Overview of stepwise regression - modelling of the dependent variable Syntax**

<table>
<thead>
<tr>
<th>Step</th>
<th>in/out</th>
<th>Step</th>
<th>Multiple R</th>
<th>Multiple R-square</th>
<th>R-square change</th>
<th>F - to entr./rem.</th>
<th>p-level</th>
<th>Variables included</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphology</td>
<td>1</td>
<td>0.463288</td>
<td>0.214636</td>
<td>0.214636</td>
<td>30.60900</td>
<td>0.000000</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Study-year</td>
<td>2</td>
<td>0.511423</td>
<td>0.261553</td>
<td>0.046918</td>
<td>7.05244</td>
<td>0.009081</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>VIQ</td>
<td>3</td>
<td>0.547418</td>
<td>0.299667</td>
<td>0.038113</td>
<td>5.98638</td>
<td>0.016000</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>RSES</td>
<td>4</td>
<td>0.563616</td>
<td>0.317663</td>
<td>0.017997</td>
<td>2.87487</td>
<td>0.092827</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Living abroad</td>
<td>5</td>
<td>0.577335</td>
<td>0.333777</td>
<td>0.016114</td>
<td>2.61219</td>
<td>0.108962</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>a - b</td>
<td>6</td>
<td>0.585333</td>
<td>0.342614</td>
<td>0.008837</td>
<td>1.43840</td>
<td>0.233048</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>AACS</td>
<td>7</td>
<td>0.587570</td>
<td>0.345238</td>
<td>0.002624</td>
<td>0.42474</td>
<td>0.515993</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>PNS</td>
<td>8</td>
<td>0.588777</td>
<td>0.347776</td>
<td>0.001538</td>
<td>0.24726</td>
<td>0.623049</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>a+b</td>
<td>9</td>
<td>0.589828</td>
<td>0.347897</td>
<td>0.001120</td>
<td>0.17867</td>
<td>0.673389</td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>
We achieved this by setting the value of $F$ to enter on a minimum, whereby $F$ to remove value should also be set on minimum (0), according to the fact that $F$ to remove always has to be less than $F$ to enter (Munk, 2011; Švec & Munk, 2011).

At the beginning the variables are not in a regression equation, no variable was entered or removed. In the first step, one variable in regression model - the variable Morphology was entered. As the table of stepwise summary (Table 1) shows, after entering one variable the determination index ($R^2$) went up by 0.214636. In the first step, its value was 0 and this model includes one variable. In the second step, two variables are in regression equation, the variable Study-year was entered. The determination index ($R^2$) went up by 0.046918, i.e. this model explains 26% variability of the variable Syntax. In the third step, the variable VIQ was entered, determination index ($R^2$) went up by 0.038113, i.e. this model explains 29% variability of the variable Syntax. In the fourth step, the variable RSES was entered, determination index ($R^2$) went up by 0.017997, i.e. this model explains 31% variability of the variable Syntax. In the fifth step, the variable Living abroad was entered, determination index ($R^2$) went up by 0.016114, i.e. this model explains 33% variability of the variable Syntax. In the sixth step, the variable $a-b$ was entered, determination index ($R^2$) went up by 0.008837, i.e. this model explains 34% variability of the variable Syntax.

In the seventh step, the variable AACS was entered, in the eight step PNS, in the ninth step $a+b$, in all three steps the determination index ($R^2$) went up approximately by 0.002, i.e. after the seventh step we achieved a model with seven variables which explains 34% variability of the dependent variable Syntax. We can observe that by stepwise entering of variables the determination index rose. Variables like Morphology, Study-year, and VIQ caused statistically significant contribution to the variability explanation of the dependent variable Syntax.

The stepwise analysis showed that Morphology or grammatical skills (correct use of grammar), Study-year, and Verbal intelligence have statistically significant impact on syntactic skills in English language. Statistically insignificant impact on syntactic skills was shown in Self-evaluation, Living abroad and in Real estimation of the students.

### Table 2. Reduction of explanatory (independent) variables of the variable Syntax

<table>
<thead>
<tr>
<th>Variable</th>
<th>Toleran.</th>
<th>R-square</th>
<th>Partial Cor.</th>
<th>Semipart. Cor.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphology</td>
<td>0.882468</td>
<td>0.117532</td>
<td>-0.463765***</td>
<td>-0.422710***</td>
</tr>
<tr>
<td>Study-year</td>
<td>0.945531</td>
<td>0.054469</td>
<td>-0.274207**</td>
<td>-0.230256**</td>
</tr>
<tr>
<td>VIQ</td>
<td>0.846715</td>
<td>0.153285</td>
<td>0.238605*</td>
<td>0.198411*</td>
</tr>
<tr>
<td>RSES</td>
<td>0.666793</td>
<td>0.333207</td>
<td>-0.080410</td>
<td>-0.065145</td>
</tr>
<tr>
<td>Living abroad</td>
<td>0.919182</td>
<td>0.080818</td>
<td>-0.180310</td>
<td>-0.148032</td>
</tr>
<tr>
<td>$a-b$</td>
<td>0.925312</td>
<td>0.074688</td>
<td>-0.115455</td>
<td>-0.093861</td>
</tr>
<tr>
<td>AACS</td>
<td>0.637537</td>
<td>0.362463</td>
<td>-0.046324</td>
<td>-0.037448</td>
</tr>
<tr>
<td>PNS</td>
<td>0.891961</td>
<td>0.108039</td>
<td>0.052823</td>
<td>0.042715</td>
</tr>
<tr>
<td>$a+b$</td>
<td>0.946104</td>
<td>0.053896</td>
<td>0.041413</td>
<td>0.033471</td>
</tr>
</tbody>
</table>

Partial and semi-partial correlations (Table 2) show us that the highest dependence, excluding the impact of other independent variables, is between the variable Syntax and the variables Morphology, Study-year and VIQ. There is an average direct proportional dependence between the Syntax skill and the Morphology score, the Study-year and the Verbal intelligence. Partial correlation indices are statistically significant. There is a low indirect proportional dependence between the variable Syntax and the variables RSES, Living abroad, AACS, PNS, $a-b$ and $a+b$, with the exclusion of an impact of other independent variables, but the indices are statistically insignificant.

### 5. Conclusion

The chosen cognitive characteristics such as Ability to Achieve Cognitive Structures, Need for Structure, personal characteristics: Verbal Intelligence, Cognitive style Category Width, Real Estimation, Self-evaluation, and variables: Years of study, Living abroad have a different level of dependence with syntactic skill in English language of an individual. An individual processes abstract structures of a foreign language, gets to know the culture of the target
language, establishes a relation to the language and the culture, tries to analyze, deduce and subsequently synthesize language units into a verbal structure in the process of foreign language learning and acquisition.

The research results have shown that a higher syntactic skill is demonstrated by a higher score in Morphology or a better performance in correct use of grammatical structures; and a shorter period of studying the foreign language. On the other hand, a lower syntactic skill is demonstrated by lower scores in Morphology in higher grades and after a longer period of studying the foreign language.

Syntactic skills of students improve with a better knowledge of grammatical rules (better performance in Morphology), when they use grammatical structures more correctly and show an above-average verbal intelligence.

The reasons for such results are that students of higher grades achieve better performance in Morphology (correct use of English grammar), they travel abroad more often (internships, stays during summer holidays) because they have better opportunities for natural proceduralization. Both of these factors can also have an impact on creation and use of grammatical structures, composition of sentences and fixed expressions, and therefore cause automatization of grammatical rules. Students with linguistic talent showing verbal productivity, ability to compose sentences in a foreign language, as well as language intuition can use grammatical rules more correctly, and those using grammatical rules more correctly show verbal productivity, ability to compose sentences in a foreign language, as well as language intuition.

It is however surprising and paradoxical that the longer students studied English, the lower was their syntactic skill in the English language. This finding opens up new possibilities for studying this fact from the point of teaching strategies, interference with syntactic structures of their mother tongue, or specifics of English syntax. It can also be connected with comprehensibility, input quality and quantity which means the quality and quantity of the input information about sentence structure in English as well as a better affective filter (uncertainty in application of given linguistic units, excessive feeling of a demanding language structure, etc.).

We can state that the observed variables explain 35 % of syntactic skills of foreign language students. Statistically significant are only the variables of Morphology (acquired, automatically used grammatical rules), Verbal Intelligence, and Length of Study (in reverse direction), which was a surprising finding. We assumed that the Personal Need for a Structure, Flexibility in Thinking (Ability to Achieve Cognitive Structures) and Real Estimation (linguistic talent), which we thought would be closely connected with structure - syntax of the mother tongue as well as the foreign language, will better explain the syntactic skill of an individual in English. But it was very surprising that self-evaluation is more connected with syntactic skill than the aforementioned variables, and that there are also other variables or factors that can better explain the syntactic skill of an individual except those we observed. These factors can be Strategies and Methods of learning as well as Teaching Styles that can become subject of further research.

References


