VERIFYING THE DEVELOPMENT OF THE ARGUMENTATION ABILITIES OF TEACHING STUDENTS

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Abstract: Part of the basic skill-set for graduates of teaching programmes should be the ability to think critically. One of its main components is the ability to argue. The subject of interest in developing this ability is for future teachers to achieve transferable ability applicable in practice. The partial objective of the large-scale experiment was to verify the development of argumentative skills through targeted training. The intervention was carried out in the summer academic semester 2015/2016, for 13 weeks on three selected subjects of study. The selection group consisted of three equal groups of students in pre-university preparation for the teaching profession at Prešov University in Prešov (control group – n = 21, experimental group 1 – n = 21, experimental group 2 – n = 20). The core measure was the Logical Thinking and Argumentation Test and the Quality Score Indicator of the ability to argue. The focused development of the selected component brought positive findings and practical recommendations.

Keywords: Ability to argue, level of logical thinking and argumentational thinking and argumentational abilities, ante and post measurement of ability to argue.

1 Introduction

We encounter the issue of arguments and argumentation every day. Few people know that argumentation is subject to strict rules of formal and informal logic, i.e. a good argument has a certain structure, that it is necessary to know the deductive and inductive reasoning based on which we can construct relevant arguments, and so on. Very little attention is paid to the development of quality argumentation in educational practice in Slovak schools. There are several reasons, but one of the most serious is that in undergraduate preparation for the teaching profession there are no modules to give a socio-scientific basis focusing on a thorough knowledge of philosophical, pedagogical thinking and the foundations of modern logic are lacking. Students in the undergraduate training for the teaching profession should have the skills to know how to think well and should be able to teach this skill to their pupils for reasons such as eliminating manipulation, defending one's own project with relevant arguments, and so on. Unfortunately, the teaching system as well as the analysis of the information sheets of modules of study of selected Slovak teacher training programs do not suggest that such a kind of discourse is part of the results of the education of the graduates of the given grades of Slovak universities (except for rare cases). The ability to argue is necessary for the needs of personal and social life. Effective argumentation is essential when planning and designing activities, advocating proposals, complex problem solving, and so on.

A partial aim of the research was to determine the level of the abilities of teaching students to argue and to determine if there is a statistically significant difference in the ability to argue before and after the targeted intervention. The inspirational source of preparation, planning and creation of activities related to the development of argumentation skills in the education of teaching students has been primarily foreign resources (e.g. Cottrell, 2005, 2011; Walton, 1998, 2013 and others).

2 Starting point in formulating the problem

The problem of argumentation was encountered even in ancient times through the beginnings of communication theories and classical rhetoric associated with the Sophists, the dialogic method of Socrates, the work of Quintilian, and so on. (Kudláčová, 2009; Kominarec and Kominarecová, 2015). According to the authors, the argument (currently considered one of the most important components of critical thinking) is the basis of communication in classical rhetoric. This method of argumentation from the period of Ancient times is, to a certain extent, accepted up to the present time, particularly in the sense of justifying facts, confirming the truth of the communicator's expression, Paul, Elder and Bartell (2003) consider the argument to be one of the key components of creating a critical judgement based on norms derived from the roots of ancient Greece. Lai (2011) found that a number of leading experts (Ennis, 1985; Facione, 1990; Paul, 1992; Halpern, 1998; Watson and Glaser, 1990 and others.) consider analysis of arguments as one of the pillars of the critical thinking process. West, Toplak and Sanovich (2008) also emphasize the ability to evaluate evidence and arguments to be an essential element of critical thinking. Schmoker and Graff (2011), Ferencová (2017) consider argumentation to be the basic skill necessary for our success as citizens, students and workers.

Foreign literature presents a large amount of knowledge on the issue of argumentation (e.g. Eemeren, Grootendorst and Henkemans, 1996; Mason, 1998, 2001; Yeh, 2002; Kuhn and Udell, 2003; Davies, 2008; Cottrell, 2011 and others). Walton (1998) in his dialogue theory has suggested seven different types of dialogues about arguments that depend on whether the aim is convincing, negotiating, gleaning information, sharing, asking, expressing emotions, or a combination thereof. The author notes that it is most important for students to be aware of strategies and goals why the given approach was chosen. This reflective activity is highlighted by several scientists (Brown, 1997; Yanklowitz, 2013 and others).

In Slovakia, the issue of argumentation is the focus of the Slovak Debate Association (SDA), which since 1999 has been devoted to the systematic development of debates (SDA, 1999). Its main goal is to teach young people to think critically – to distinguish quality arguments from inferior ones, facts from opinions, and so on; and other skills - teamwork, learning, finding solutions, research skills, and so on.

As indicated above, the ability to argue is an essential element of critical thinking and should be developed in a future teacher. As a result, the question arises as to whether the students in the teaching process can argue and whether this ability can be developed by targeted training. In designing a development program for the selected component, we were inspired by Cottrell's (2011) recommendations that offer critical thinking skills structured to help students build this ability from basic understanding to applying techniques and strategies and other works mentioned above.

3 Measuring the experiment

The development of students' argumentation abilities was part of an extensive intervention program for the development of critical thinking in teachers. The partial objective of the experiment was to verify whether targeted training would increase the indicator of ability to argue. A proper experiment – single-factor parallel groups – was used to verify the aim.

The operational definition of the variable *ability to argue* (a defined variable in the position of the dependent variable): systematically, intentionally (13 weeks), within the three selected subjects (3 hours a week), the development of the selected skill specially trained for this purpose by a trained teacher.

Two means were used to measure the starting and final values of this variable:

- The Logical Thinking and Argumentation Test (TLMAS), the tasks of which were created by the SCIO company (2015, a society focussed on the development of critical thinking in the Czech Republic). The tasks in the logical and argumentation part tested the basic skills and abilities that a

student needs for successful college studies. The sub-tests in the logical and argumentation sections included 18 tasks (each subtest had 9 tasks). The role of the respondent was to use the rules of formal and informal logic. The time limit was set to approximately 30 minutes. In testing the students, all the author's recommendations were followed.

- *Indicator of quality of ability to argue* was used for three starting and final tests in all groups included in the experiment. This ability was evaluated in every subject using worksheets with study text and a statement where the task of the subject was to analyse the statement and determine: 1) the first specific detail and two relevant comments to go with it; 2) the second specific detail and to relevant comments to go with it; 3) the conclusion of the argument (on the basis of proofs of whether the argument is true or not) – 7 points total for the worksheet.

In characterising the individual groups of subjects included in the experiment, the basic statistical characteristics were used (Kerlinger, 1972): number (*N*), relative number (%), mean (*M*), standard deviation (*SD*), minimum and maximum value. The differences between groups in terms of the ante measurements were performed using one-way ANOVA. The differences between the ante and post measurements were found using the t-test of comparing means.

The basic group consisted of students of teaching at the Faculty of Human and Natural Sciences, the Philosophical Faculty and the Faculty of Sport at Prešov University in Prešov. We initially selected (Švec, 1998) 17 groups of students (N = 365) and tested the subject's initial levels of argumentation at the beginning of the winter semester of the academic year 2015/2016. For the needs of the experiment, we selected three (in terms of ante measurement) balanced classes of students. We randomly assigned experimental conditions to the selected groups (experimental group 1 / EG1 / - n = 21 students; experimental group 2 / next EG2 / - n = 20 students; control group / next CG / - n = 21 students).

4 Results of the experiment and discussion

In this part we present selected components related to the experimental verification of development of the ability to argue in selected groups of the teacher training programme at Prešov University in Prešov.

4.1 Equivalence of the experimental groups in the ante measurement

One of the conditions for implementing the right experiment is the matter of choosing equivalent groups (Kerlinger, 1972). Experimental groups took the TLMAS test, which is a commonly used tool for finding the general requirements needed for university study. It contained two subtests - Logical Thinking (9 Tasks) and Argumentation Skills (9 Tasks). The subject's job was to investigate the statement and assess the adequacy or validity of its assertions. For each correctly performed task, the student was awarded 1 point. Table 1 shows the descriptive statistics for TLMAS test scores achieved in individual groups.

Table 1 *Descriptive statistics of ante measurement of groups using the TLMAS test*

Groups	**Gross score**				
	Number (n)	Average (M)	SD	min	max
Cotnrol group	21	7,76	2,89	4,00	14,00
Experimental group 1	21	7,71	2,88	2,00	13,00
Experimental group 2	20	7,40	3,33	3,00	14,00
Total	62	7,62	2,99	2,00	14,00

Legend: SD – standard deviation; min – minimum value; max – maximum value

One-way ANOVA found that there are statistically significant differences between the individual groups (KS, ES1, ES2) in the average gross TLMAS score before application of the intervention programme. Table 2 shows the results of the one-way ANOVA.

Table 2 *Equivalence of groups on the basis of the results achieved in the TLMAS test*

Sum of Squares	**d.f.**	**Mean Square**	**F**	***p – value***
1,573	2	0,786	0,085	0,919

Legend: df – degree of freedom (d.f.); F = statistical criterion; Sig = p – probability of mistaken rejection of the null hypothesis

On the basis of results of one-way ANOVA we can state that between the individual groups there was no statistically significant difference in average gross score achieved in the TLMAS test in the ante situation ($p > 0.05$). This confirms the equivalence of the groups.

4.2 Results in the ante and post measurements

The aim of the experiment was to find if the intervention with the teaching students increased their ability to argue. The following tables present the results of the t-test comparing means in the ante and post measurements.
Table 3 presents ante and post measurements of the ability of students to argue achieved in the TLMAS test.

Table 3 *T-test comparing means achieved in TLMAS in ante and post measurements*

Gross Score TLMAS	*N*	*M*	*SD*	Difference *M*	Difference *SD*	t	*p*
ante control group	21	7,76	2,89				
post control group	21	7,33	3,08	0,42	2,71	0,72	0,477
ante experimental group1	21	7,71	2,88				
post experimental group 1	21	9,66	3,32	-1,95	1,82	-4,89	0,000
ante experimental group 2	20	7,40	3,33				
post experimental group 2	20	10,10	3,41	-2,70	3,09	-3,89	0,001

Key: N – number; M – average; SD – standard deviation; t – result of t-test; p-value

In the t-test used (table 3) it was shown that the targeted training in ES 1 ($p = 0.000$) and ES 2 ($p = 0.001$) increased the logical and argumentation ability with a level of significance $p < 0,001$ compared to the control group ($p = 0.477$), where the traditional form of education took place i.e. without specific training in argumentation ability.

The ability of the subject to argue was monitored in three ante and three post measurements using the quality indicator of the argument evaluated according to predetermined criteria. Specific findings are presented in Table 4.

Table 4 *T-test comparing achieved means of ability to argue*

Measurement	*N*	*M*	*SD*	Difference *M*	Difference *SD*	t	*p*
CG ante 1	21	2,33	1,31				
CG post 1	21	2,47	1,32	-0,14	0,72	-0,900	0,379
CG ante 2	21	2,38	1,28				
CG post 2	21	2,52	1,24	-0,14	0,79	-0,826	0,419
CG ante 3	21	2,14	1,01				
CG post 3	21	2,42	1,24	-0,28	0,95	-1,369	0,186

EG1 ante 1	21	2,66	1,79				
EG1 post 1	21	4,33	1,35	-1,66	1,15	-6,614	0,000
EG1 ante 2	21	2,42	1,53				
EG1 post 2	21	4,61	1,39	-2,19	1,07	-9,312	0,000
EG1 ante 3	21	2,19	1,28				
EG1 post 3	21	4,85	1,35	-2,66	1,06	-11,47	0,000
EG2 ante 1	20	2,55	1,73				
EG2 post 1	20	4,50	1,70	-1,95	1,19	-7,322	0,000
EG2 ante 2	20	2,20	1,28				
EG2 post 2	20	4,65	1,49	-2,45	1,27	-8,585	0,000
EG2 ante 3	20	2,40	1,50				
EG2 post 3	20	4,55	1,63	-2,15	1,18	-8,134	0,000

Key: CG – control group; EG – experimental group; N – number; M – average; SD – standard deviation; t – result of t-test; p-value

The same statistical test, showed that intervention increased the ability to argue (Table 4) in both experimental groups ($p < 0.001$) in contrast to the control group, where the teaching was traditionally conducted. In that group there were no significant differences between ante and post-measurements ($p = 0.164$).

It must be noted that although we have achieved positive results in the monitored component, the whole process of preparation for the given type of teaching was very challenging and the beginnings were very difficult. The biggest barrier is that the students were mostly not used to working in depth (except for some individuals), as evidenced by the level of analytical thinking of several groups of university students (Kosturková, 2016). Other barriers may also be those identified by Cottrell (2011): school culture, lack of desire of the educator to work in depth, limited feedback or lack of feedback, time limitation, limited availability of resources, and so on. From this it is possible to infer that there are two basic types of obstacles to the development of the ability to argue: internal and external

Students in the experimental groups have gone through a variety of argumentation techniques throughout the duration of the experiment. In the beginning, easier methods were used such as, for example, T-schemes, Venn diagrams, constructive disagreements, but also harder ones, such as creating an argumentation line, identifying and analysing logical errors in political debate, preparing and implementing a Karl Popper style debate. A source of inspiration can also be various argumentation tasks created using the SCIO (2015) tests, the argument assessment task based on the Critical Thinking Criteria (Watson and Glaser, 1990). We consider an interesting method to be essay writing following the Schaffer model (1995). Its simplified argumentation scheme has an exact order: the statement, specific details, supporting evidence, comments and commentary, more comments followed by commentary. If the educators can handle the basic paragraph (e.g. 4 sentences), they should add additional specific details and always use the ratio of two comments per detail. Later students add a final judgment. Nemčok et al. (2014) point out that each argument must have a statement, analysis (explanation) of the argument, proof and summary of the argument. One of the students' outputs was the preparation and implementation of a debate on a chosen topic. Recommended literature in the preparation was mainly information from foreign experts (e.g. Warburton, 1996; Cottrell, 2005; Cottrell, 2011; Walton 1998 and 2013). Part of the seminars of selected study subjects included examples and recommendations on how to construct arguments (for example, according to experts from the University of Plymouth, 2009, etc.).

5 Conclusion

In the environment of Slovak universities and colleges preparing future teachers, we record a significant deficit of empirical studies focusing on the issue of argumentation as an important component of critical thinking. Particularly in teacher study programs, we consider it important to develop this competence in order for future teachers to acquire this transferable skill, which they will also be able to apply in school education. This ability can help the individual evaluate products, services, and resist media manipulation. Several pieces of foreign research and the results of our experiment have shown that through targeted training it is possible to acquire a number of argumentation techniques and strategies to develop the ability to argue relevantly. In general, graduates of a given level of education are expected to have developed critical thinking – the argumentation, analytical skills required at national and international level as the competencies of the future as defined, for example, by World Economic Forum (2018).

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