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Measuring the educational value of the online discussion groups: a gender analysis

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Abstract. Social media technologies provide various forms of educational support. Online discussion groups have been created by educators to maintain a closer relationship with the students. Although the online discussion groups are widely used in universities, the research on this topic has been carried on mainly by qualitative studies. There are few approaches measuring the educational support provided by the online discussion groups. The main objective of this paper is to analyze the gender differences in the perception of the educational support provided by the online discussion groups. The educational support has been conceptualized as a global factor that manifests along three dimensions: support for teaching, support for personal development and support for professional formation. An invariance analysis has been carried on that showed a metric invariance of the model. The gender analysis results show that both female and male students consider that the discussion groups stimulate the collaborative learning, facilitates sending the projects to the teacher and stimulates the initiative in learning. Meantime, female students scored higher almost all items.

Keywords: Online discussion groups, gender differences, educational support, social media technology, multidimensional model, invariance analysis.

1. Introduction

The development of social media technologies created new opportunities for the educational processes. The use of online social networks can lead to the development of user habits which, in turn, are continuosly changing the pedagogical methods, in order to come closer to the students' online context and to develop mutual interactions between colleagues.

Higher education needs an instrumental communication focusing on specific purposes, in order to support a systematic learning process. The online discussion is a form of communication that enables a permanent exchange of messages and documents and fast answers to various requests and creates a more personalized relationship than in the *face-to-face* traditional education (Vlasie, 2007).

The online discussion groups have been created by educators to maintain a close relationship with their students. Nevertheless, the educational support is not limited to teaching. The participation in online discussion groups is also useful for personal and professional development. The research on this topic has been carried on mainly by qualitative studies and there are few approaches aiming to measure the various kinds of educational support provided by the online discussion groups. Also, few studies exist that analyze the gender differences as regards the use of online discussion groups by university.

The main objective of this paper is to analyze the gender differences in the perception of the educational support provided by the online discussion groups. In order to do this, a multidimensional model has been developed and tested with university students. The educational support has been conceptualized in a recent work (Gorghiu et al., 2018) as a global factor that manifests along three dimensions: support for teaching, support for personal development and support for professional formation. Prior to gender analysis, an invariance analysis has been performed on in order to check if both genders perceive the evaluation instrument in the same way.

The rest of this paper is organized as follows. The next section presents the theoretical grounding and conceptualization. In section 3, the results of the empirical study are presented. The paper ends with discussion and conclusion.

2. Theoretical background and conceptualization

2.1 Related work

The potential positive benefits of online discussion groups in the educational context have been repeatedly researched in the last decade. The interactions on educational topics in online discussion groups can support productive

discourse between students, facilitating collaborative learning, personal development and critical thinking.

In order to be qualified as a form of e-learning, Vlasie (2007) identified certain conditions the online discussion groups should meet: (a) to aim at the main elements related to the optimization of the teaching process, such as: facilitation of teacher-student, student-student or student-curriculum interactions; (b) to represent a mean of transmission and didactic transposition of the educational content; (c) to facilitate a fast teacher-student and student-teacher feedback; (d) to represent a relevant resource for the teaching activity; (e) to encourage students to explore topics pertaining to disciplinary, interdisciplinary and transdisciplinary interest, through their own involvement and collaboration with the other members of the virtual community.

Several studies involving college and university students (Alagoz, 2013; Gikandi et al., 2011; Noroozi et al., 2013; Oldmeadow et al., 2012; Romero et al., 2013; Seethamraju et al., 2014; Wan et al., 2008), mention the introduction of online discussion groups as a suitable educational strategy, but also as an indicator of the students' performance, which empowers flexible and independent learning and knowledge building.

Asterhan et al. (2012) explored potential differences between female and male students involved in online discussion groups. Another goal of the study was to examine whether online teacher guidance can improve the quality of small-group synchronous discussions, and whether different types of guidance (epistemic or interaction guidance) affect these discussions differently, when compared to an unguided condition. The findings show that teacher guidance of synchronous, online discussions in classrooms is realizable and reasonably reaches its intended goals. Also, training should be focused on acquiring various guidance strategies to augment their beneficial effects. Gender differences in favour of girls were found both on the argumentative as well as the collaborative dimension of the discussions.

The study conducted by Blum (1999) surveyed male and female learners enrolled in computer mediated communication-based distance education with regards to their preferences for learning strategies, communication patterns, and participation barriers. The results indicated that male students prefer to learn unaccompanied while female students favor the group-oriented work. Yau & Cheng (2012) also investigated gender differences related to the utilization of technology for learning purposes and found that males might

exhibit more confidence in using technology for learning purposes due to socio-contextual factors.

The study of Guiller & Durndell (2007) discusses findings from an extensive project examining gender, language and computer-mediated communication (CMC) in the context of undergraduate psychology courses. Gender interactions were analysed in terms of positive and negative socioemotional content, focusing on explicit markers of agreement and disagreement. Gender-related patterns in language use and interaction style were found. Females were more likely than males to make attenuated contributions and express agreement, whereas males were more likely than females to make authoritative contributions and express disagreement.

Other studies concentrated on the problem of instructor gender, considered to play an important role in influencing student ratings. In the study of MacNell et al. (2015), assistant instructors in an online class each operated under two different gender identities. Students rated the male identity significantly higher than the female identity, regardless of the instructor's actual gender, demonstrating gender bias.

Cristescu & Iordache (2017) analyzed the main educational advantages and disadvantages related to the use of online discussion groups by university students. The main advantages mentioned by students were: more effective and fast communication between teacher and students, finding out new information, stimulating the cooperation, interaction and development among students.

In addition, the study of Iordache et al. (2018) explored the potential of online social networks as facilitators of the educational activities in two universities from Romania. The results illustrate that the university students' preferred facilitators are represented by the web page of the group of students, but also the discussion groups set up on Facebook. In fact, the Facebook groups are primarily considered sources of information, with a huge potential to develop interactive, engaging projects and assignments for students, targeting to build important learning communities (Ştefănică & Zbuchea, 2014).

2.2 Conceptualization

The educational support (EDS) has been conceptualized as a second-order, multidimensional construct with three dimensions (conceptualized as first

order constructs): teaching support (TS), social learning support (SLS), and professional formation support (FS).

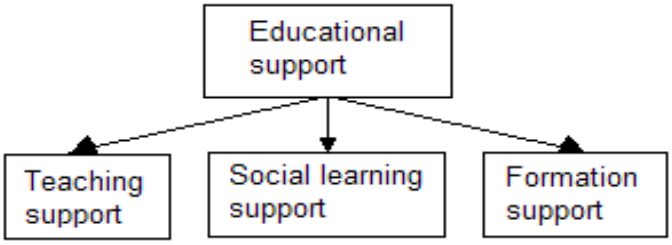

Figure 1. The research model

The *Teaching Support Dimension* (*TS*) refers to support provided for the teaching process, such as receiving working tasks or homework by students, sending projects to the teacher, and self-evaluation of results.

The *Social Learning Support Dimension* (*SLS*) refers to the support provided for personal development by stimulating critical thinking, the learning initiative, the collaborative learning, and the metacognitive skills development.

The *Formation Support Dimension* (*FS*) refers to the support for broadening the knowledge horizon, for student's training, but also for the formation as future teacher.

The nominated constructs (TS, SLS and FS) are mentioned and discussed also in the scientific literature (Al-Rahmi et al., 2016; Courtney & King, 2009; Cristescu & Iordache, 2017; Kenedy-Clark et al., 2017).

The operationalization of the above-mentioned constructs is presented in Table 1.

Table 1. Variables considered for assessing educational support

Item	Description
TS1	The discussion group facilitate sending the projects to the teacher
TS2	The discussion group facilitate the self-evaluation
SLS1	The discussion group stimulate the development of critical thinking
SLS2	The discussion group stimulate the initiative in learning
SLS3	The discussion group stimulate collaborative learning
SLS4	The discussion group stimulate the development of metacognitive abilities
FS1	The discussion group facilitate the broadening of the knowledge horizon
FS2	The discussion group facilitate the formation as student
FS3	The discussion group facilitate the formation as future teacher (instructor/tutor)

3. Empirical study

3.1 Method and samples

The data has been checked for normality (skewness and kurtosis) and outliers with SPSS for Windows. Then the model has been tested with AMOS 7.0 for Windows (Arbuckle, 2006), using the *maximum likelihood estimation method*. The model testing results have been analyzed by using the *GOF* (*goodness-of-fit*) indices recommended by Hair et al. (2006).

Convergent validity has been assessed by examining the loadings and their statistical significance through *t*-values, the composite reliability, and the average variance extracted. In this respect, the factor (in this case, dimension) loadings of all standardized items should be greater than 0.50, ideally exceeding 0.7. Item reliability indicating the amount of variance should be greater than 0.50. Composite reliability (CR) measuring the internal consistency of a construct should be at least 0.60, preferrably greater than 0.7 (Fornell & Larcker, 1981). The average variance extracted (AVE) measuring the amount of the variance captured by the construct should be greater than 0.50 (Hair et al., 2006).

The scale reliability has been analyzed checking the magnitude of Cronbach's alpha.

As regards the gender differences, if the variables under consideration are measures of an underlying model, an invariance analysis is needed to test if respondents are interpreting the variables in the same way (Steenkamp & Baumgartner, 1998; Vandenberg & Lance, 2000). The invariance analysis has been carried on with multi-group confirmatory analysis (MGCFA) under Amos for Windows.

The sample includes 302 students from different specializations of the Valahia University Targoviste (117 men and 185 women) enrolled in bachelor and master programs. Most of the questioned students are undergraduates (71.1%). The age is varying between 19 and 52 years old, with a mean of 25.89 (SD=7.68).

Data collection was made using a print survey administered to all the participants. The participants have been asked to rate the items on a 1 to 5 Likert scale.

3.2 Model testing results

The first step is to check if the model has configural invariance across genders (same pattern of free and fixed factor loadings on the items) which means to test if the male and female students are perceiving the evaluation instrument in a similar way. This is done by testing the model on each group.

The model testing results are presented in Table 2 (GOF indices) and Figure 2. The GOF indices indicate an acceptable fit of the model with the data.

Table 2. Model testing results

Group	N	χ^2	p	DF	χ^2/df	TLI	CFI	RMSEA	χ^2/df
Male	117	41.449	.015	24	1.727	.915	.943	.079	.0611
Female	185	62.620	.000	24	2.609	.905	.937	.094	.0534

The factor loadings are above the threshold of 0.6, with two exceptions (SLS1, male sample and SLS3, female sample) which shows that the first-order constructs are unidimensional. The factor loadings (standardized regression coefficients) are statistically significant at $p<0.01$ level.

The composite reliability of the first-order factors (CR) is acceptable, being above the threshold value of 0.60, with values ranging from 0.608 to 0.835. Also, the average variance extracted for each factor (AVE) is acceptable given the exploratory nature of the study, with values ranging between 0.416 and 0.550.

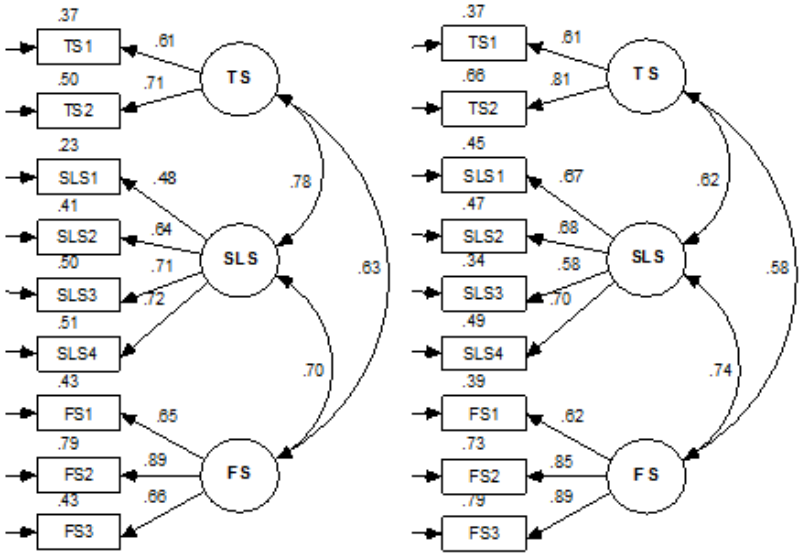

Figure 1. Model testing results for male students (left) and female students (right)

The correlation between factors is good. The correlation coefficients are statistically significant at $p<0.001$ level and are ranging from 0.58 to 0.78.

The reliability of the measurement scale was verified with Cronbach's alpha and the values ranged from 0.600 to 0.824. The scales reliability for the two samples are given in Table 3.

Table 3. Scale reliability (Cronbach's alpha)

Sample	N	TS	SLS	FS
Male students	117	.600	.722	.759
Female students	185	.660	.756	.824

3.3 Invariance analysis

The next step was to test the model on a sample fitting both groups (N=302). The model testing results show an acceptable fit of the model with the data: (χ^2=104.073, df=48, p=0.000, χ^2/df=2.168, TLI=0.908, CFI=0.939, SRMR=0.0468, RMSEA=0.062 (0.046-0.079), pclose=0.103.

Then, a series of nested models have been tested to check the metric and scalar invariance. The testing results are presented in Table 5.

The first model constrained the factor loadings (measurement weights) to be equivalent across genders. Although the results show a significant chi-square difference ($\Delta\chi^2 = 13.467$, $\Delta DF = 6$, $p = .036$), the CFI depreciation is lower than 0.01 which means a metric invariance, according to the criterion of Cheung & Rensvold (2002). This means that the model has been perceived in the same way in each group and enables the comparison of observed scores.

Table 5. Invariance analysis results (model comparison)

Model	DF	χ^2	CFI	d DF	d χ^2	d CFI	P
unconstraint	48	104.073	0.939				
Meas. weights	54	117.540	0.931	6	13.467	-0.008	0.036
Meas. intercepts	63	139.037	0.917	9	21.497	-0.014	0.011

The next model constrained the intercepts to be equivalent across genders. The model comparison showed a significant chi-square difference ($\Delta\chi^2 = 21.497$, $\Delta DF = 9$, $p = .011$) and a CFI depreciation larger than .01 which means a lack of scalar invariance.

3.4 Gender analysis

The metric invariance enables the analysis of gender differences as regards the observed scores. The differences are presented in Table 6, together with the results of the one-way ANOVA (1, 300, 301) test for significance.

Table 6: Gender differences (Romanian university students).

Gender	TS1	TS2	SLS1	SLS2	SLS3	SLS4	FS1	FS2	FS3
Male	3.74	3.26	3.51	3.66	3.84	3.34	3.75	3.44	3.12
Female	4.06	3.36	3.68	3.90	4.22	3.58	4.00	3.39	3.38

F	4.255	.445	1.291	3.103	8.774	2.775	3.713	.135	2.589
Sig.	.040	.505	.257	.079	.003	.097	.055	.714	.109

As it can be noticed, the female students scored higher on all items, except for FS2 (formation as student). The differences are statistically significant for TS1 (facilitates sending the projects to the teacher), SLS3 (stimulates collaborative learning), and FS1 (broadens the knowledge horizon), and marginally significant for SLS2 (stimulates initiative in learning) and SLS4 (development of metacognitive abilities).

There are some inherent limitations for this study. First of all, the study is exploratory. In this respect, it may be seen as a pilot study having as main goal the initial development and validation of the scale. Second, the sample is relatively small for an invariance analysis. Third, the teaching support scale has only two items.

4. Discussion and conclusion

This paper contributes with an additional empirical validation of the multidimensional model of the educational support provided by the online discussion groups. The model testing results showed an acceptable model fit with the data on two relatively small samples. The invariance analysis results show that the model exhibits metric invariance across genders, which means that male and female students are perceiving the model in the same way.

The results of this study are relevant since the model has been tested on university students that will become teachers after graduation.

For both genders, the highest rated item was SLS3 (discussion groups stimulate collaborative learning), followed by TS1 (discussion groups facilitate sending the projects to the teacher, FS1 (discussion groups broaden the knowledge horizon) and SLS2 (discussion groups stimulate the initiative in learning).

Overall, both genders consider that the main outcomes of the discussion groups are the stimulation of collaborative learning and initiative in learning, as well as a better way for sending the projects to the teacher. As regards the differences, the female students scored higher on all items, except the item related to the formation as student.

As regards the similarities in the perception of the online discussion groups, the results confirm the findings of the qualitative study of Cristescu & Iordache (2017): discussion groups are providing a better communication between teacher and students and are stimulating the cooperation between students. As regards the differences, the results are similar with the results of other studies showing that female students are more interested in the collaborative learning.

The results of the empirical study show that the social interaction in general and online discussion in particular are providing a valuable educational support. Apart from the teaching support, the social learning

support provided by the online discussion groups are stimulating students to develop critical thinking, work collaboratively and have more initiative in learning. Last but not least, online discussions may contribute to a better professional formation as future teachers.

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