CONTENT

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The paper. The paper is carefully formatted according to the template of the journal (see bellow). Special attention is paid to the exact application of the Harvard referencing convention to both continuous citations and list of references. If an electronic source has the DOI number assigned, also it will be provided in the list of references. Manuscripts are submitted via the editorial system in the DOC.

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EDITORIAL

We are glad that we can present you the third issue of the year 2017 (vol. 10, no. 3). First, we are pleased to announce that we have upgraded the editorial system of ERIES Journal. During the last couple of months, our team of Technical editors together with the Executive editors were preparing the new editorial system and testing its functionality. The principal aim was to make the upgrade as smooth as possible that none of our contributors would deal with any problem. The upgrade of the system was successfully completed in September and the system is fully functioning since then. We hope that all our contributors and reviewers, as well as the members of the Editorial board, will find the new editorial system user friendly.

With the new editorial system, ERIES Journal has improved the publication, licencing and archiving policy, which complies with all current requirements for scientific journals and would be beneficial for our readers and contributors. In addition, we have applied for inclusion of ERIES Journal to another database that we hope to announce soon.

Last but not least, we are glad to introduce in this third issue four articles from diverse group of authors covering following institutions: Czech University of Life Sciences Prague, Czech Republic; University of Pardubice, Czech Republic; La Salle University México, Mexico; University of Economics, Prague, Czech Republic; and Charles University, Prague, Czech Republic. We are grateful that ERIES Journal attracts diverse authors from different higher education institutions. It is a commitment for the Editorial board to keep improving the journal quality and being the leading journal in the education research in the Czech Republic.

The first article "Conditions for development of rural community education in the Czech Republic", from authors Jakub Husák and Helena Hudečková, deals with concepts of the learning society and community-led local development, specifically focused on community education in rural areas of the Czech Republic. The research focuses on identification of objective and subjective conditions for the development of community education and with the development of activities of Rural Community Schools, both from the supply and demand perspectives. The results of the research show the higher importance of subjective conditions for the successful development of community education in the Czech Republic. Moreover, the demand for educational activities provided by Rural Community Schools as a positive factor in their development.

The second article "Effect of the use of computer-aided assessment system in the teaching of mathematical analysis with regard to students' approaches to learning" from author Andrea Jahodová Berková focuses on the efficiency of the use of the Maple T. A. (teaching and assessment) platform to increase students' performance in classes of mathematical analysis (calculus). For this reason, the pedagogical experiment was conducted on the first and later second year undergraduate students of teaching mathematics taking into consideration their approaches to learning and studying. The results indicate that the use of Computer-aided assessment system in teaching positively affects student´s performance in final tests. On the other hand, different approaches to learning do not affect students' overall results.

In the third article "Analysis of professors' evaluation at La Salle University México from 2010 to 2016: What the results indicate?" the collective of authors Martin Flegl, María Bertha Fortoul Ollivier, Václav Švec, Jennie Brand Barajas and Christian Vizuet presents introductory study related to a system of professors' evaluation at La Salle University México. The objective of the study is to analyse the obtained results from the evaluation system and get insights into this evaluation. Furthermore, the main objective of the study is to analyse whether there are differences between faculties regarding the evaluation. The analysis shows that the evaluation is highly skewed towards the maximal evaluation at all faculties. What is more, there are statistically significant differences in the obtained evaluations regarding the faculties. In addition, the authors conclude the introductory study with possible future steps that should be consider regarding eventual structural changes in the evaluation system.

The last article "Measuring the efficiency of the Czech public higher education institutions: An application of DEA" from Eva Jarošová, Hana Lorencová, Kateřina Půbalová and Lukáš Šedivý presents an analysis related to usefulness of teaching methods in MBA programme. For this purpose, the authors use a sample of 54 Czech participants in the MBA programme and lifelong learning programmes at the University of Economics, Prague. The data were acquired from written or electronically submitted questionnaires and analysed in relation to the usefulness of the teaching methods for understanding the concepts of leadership, leadership skills development as well as respondents' personal growth. The results show that the respondents most valued the methods that enabled them to get feedback, activated them throughout the programme and got them involved in discussions with others in class.

We would like to thank to all reviewers who contributed to this third issue of 2017, as well as we would also like to thank all authors who have submitted their manuscripts to ERIES Journal. We hope that all our readers will find this issue interesting, and we also hope that ERIES Journal will continue contributing to the field of efficiency and responsibility in education with new insights, research methods and analyses as it has contributed so far.

Martin Flégl
Executive Editor
ERIES Journal

CONDITIONS FOR DEVELOPMENT OF RURAL COMMUNITY EDUCATION IN THE CZECH REPUBLIC

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Highlights
- *Identification of objective and subjective conditions for development of community education*
- *Evaluation of the development of the main activities of Rural Community Schools*
- *Identification of strengths and weaknesses in the development of Rural Community Schools*

Abstract

The paper is based on the concepts of the learning society and community-led local development, specifically focused on community education in rural areas of the Czech Republic. The research questions are connected with the identification of objective and subjective conditions for the development of community education and with the development of activities of Rural Community Schools, both from the supply and demand perspectives. The aim is fulfilled through a secondary analysis of Rural Community Schools' websites and mainly through primary research carried out by interviewing techniques with a high level of standardisation, conducted with the main actors (Community Coordinators) of Rural Community Schools. The results of the study show the higher importance of subjective conditions for the successful development of community education in the Czech Republic. The paper also identifies the demand for educational activities provided by Rural Community Schools as a positive factor in their development. On the other hand, weaknesses could mainly be seen in cooperation with local partners. This is also the main possibility or necessity for their successful future development.

Introduction

The paper is based in general on the concept of the learning society and learning regions which are commonly used as the background for community education (Maskell and Malmberg, 1999; Lam, 2002; Morgan, 2007). These concepts are currently shifted to the higher level of a whole society. Nielsen and Lundvall (2006) use the term "learning economy", which is defined as one in which the ability to attain new competencies is crucial to the performance of individuals, firms, regions and states. Considering local education and especially community education in rural areas, it is also necessary to deal with the concepts emphasising endogenous development and "bottom-up" approaches to rural development (Atterton, 2007; Lee *et al.*, 2005; Shucksmith, 2000). These concepts deal with networking and the participation of citizens in local and regional development as crucial factors in the successful implementation of an endogenous approach to rural development (Falk and Kilpatrick, 2000). Also regional development theories dealing with the issue of the ability to learn through cooperation (Hudson, 2007; Lundvall and Nielsen, 2007) form the theoretical background for community education.

The third theoretical concept used in the paper is the concept of community education as a modernisation trend in education. The concept of community education has been spreading since the 1960s. This is the reason for its inconsistent conceptualisation and diverse applications in different states. There is a constantly applicable common basis – the involvement of people from outside the school and close links between the school and the local community (Heers *et al.*, 2011). Sanders (2003) stresses various elements of community education, but explicitly emphasises the collaboration of local schools with parents of school children, with local entrepreneurs, with local associations and also with universities. The main mission of community education is to provide opportunities for lifelong learning and participation in community development to adults, working class people, minority learners, women with young children and also to members of rural communities who are disadvantaged due to the decreased availability of other educational possibilities (Staykova, 2012). The priority objective of rural community education is mainly to develop new skills and communication skills and cooperation with an educational institution within the rural community – e.g. local authorities, local action groups, entire families and various local associations and organisations (Biriescu and Babaita, 2014). In general, community education extends classic education, especially from the perspectives of its socialisation function, social aspects, sociopolitical aspects and temporal dimension (Coleman, 1987).

Community education in rural areas of the Czech Republic is realised through Rural Community Schools. In the Czech Republic, this type of organisation is obviously defined as "an educational facility which is located in a municipality of less than 5 000 inhabitants, with prescribed legal form (NGOs, municipal contributory organisation, secondary economic activity of the local school), which offers lifelong education to adult residents of the catchment area, and regularly participates in community development activities and community life, managing its own budget and respecting the principles of financial self-sufficiency and sustainability" (Hudeckova and Husak, 2015: 34). Only marginal attention is paid to the research of community education in the Czech Republic, due to the short-term application of this concept (between 5 and 10 years). As stated by Kalenda and Smekalova (2015), the appropriate interpretative framework for community education in the Czech Republic is still absent.

However, research by these authors equates the perception of community education with the consensual concept defined by solidarity and stability.

In this context, the paper strives to deepen the knowledge of community education in the Czech Republic and specifically that of the rural community education which is carried out by Rural Community Schools. This paper, based both on secondary and primary research, deals with the ensuing research questions: Which are the main objective (conditions based on the surroundings of RCSs and specific features of the locality where the RCS is situated) and subjective (conditions based on cooperation and involvement of local people with RCSs) endogenous conditions for development of Rural Community Schools in the Czech Republic? How do Rural Community Schools fulfil their mission in rural areas? Are their activities increasing or decreasing? The principal aim of the paper is to identify the main endogenous conditions for the development of Rural Community Schools (RCSs) in the Czech Republic and to evaluate the development of their various activities including their strengths and weaknesses. For this reason, the Results subsection of the paper is structured in four parts, focused on the evaluation of subjective and objective endogenous conditions for the development of RCSs, supply and demand perspectives of RCS activities, promotion of the activities and networking of RCSs with partners at local and supralocal levels.

Materials and Methods

From the methodological perspectives, the paper is based both on primary and secondary research techniques. A secondary approach is used for the analysis of RCS websites, with special attention paid to educational courses provided and other activities of RCSs. In addition, websites of the National Network of Rural Community Schools (NNRCS) are used for secondary analysis. The data obtained by secondary analysis were used especially for check and update the list of more and less active RCSs and for more detailed analysis of content of supplied courses (it form the basis for ensuing primary research).

Moreover, the paper stems from the long-term focus of the author on the issues of education and especially on community education in rural areas. Firstly, the significance of RCSs was identified by the author in 2010 under the project "Education for rural areas as a part of regional development priorities", supported by the Internal Grant Agency of the Faculty of Economics and Management of the Czech University of Life Sciences in Prague (IGA FEM CULS). Within this project, the main educational activities in rural areas of the Czech Republic were identified. The ensuing research project in 2012, called "Rural community school—institute for education and innovation workshop (case study of rural municipalities in the territory of LAG Pošumaví)" and also supported by IGA FEM CULS, was specifically focused on the research of establishing a network of RCSs on the territory of LAG Pošumaví. The third research project supported by IGA FEM CULS in 2014 – "Appreciation of Natural and Sociocultural Potential of Rural Areas through Activities Contributing to Social Inclusion" – was specifically focused on the selected activities of RCSs and mainly on the socially inclusive activities. The aforementioned experience of the author has also led to the ability to identify subjective and objective conditions for the development of RCSs in the Czech Republic and to evaluate the development of their various activities. The paper presents an extended version of the results published within "Proceedings from the International Conference on Efficiency and Responsibility in Education 2016" (Husak and Hudeckova, 2016). The paper

is extended mainly by the identification of subjective and objective conditions for the development of RCSs in the Czech Republic, the issue of funding of RCSs, attention paid to RCSs within municipal development strategy and the evaluation of the involvement of local teaching staff in community education.

The proposed primary research is based on the above-mentioned experience. From the total number of 37 RCSs in the Czech Republic, 22 RCSs (after the correction in 2015) were identified as active (Husak and Hudeckova, 2015). Sixteen of the active RCSs were selected as an object for the research. Therefore, the primary research consists of 16 interviews (each with a duration of approximately 90 minutes) with a high level of standardisation. The interviews were conducted with the main actors (Community Coordinators) of the chosen RCSs in the Czech Republic. The selection of interviewed RCSs was based on the indicator of high/less activity of RCSs – 8 selected RCSs rank as being very active (more than 8 courses per year) and 8 selected RCSs rank as being less or moderately active (less than 7 courses per year) – according to the criteria specified in detail in the previous research (Husak and Hudeckova, 2015). The interviews consisted mainly of the issues of the evaluation of subjective and objective conditions for the development of RCSs, the development of courses and other activities of RCSs, both from the supply and demand perspectives, promotion of RCSs within the locality and current and possible partnerships within the locality and also outside the locality.

Results

The concept of community education is fairly new (about 90 years). It has been implemented in Central Europe for about 20 years and specifically in the Czech Republic for 10 years with regard to the rural areas. Thirty-seven RCSs exist in the Czech Republic and, according to the valid rules (NNRCS, 2011), they may operate within municipalities of up to 5 000 inhabitants (there is one exception – Telč with 6 111 inhabitants). The first RCSs were established in 2005 and most of the RCSs were established by 2010. So, the 10 (or minimally 5) years of existence of RCSs are sufficient for the evaluation of the development of RCSs with regard to their activities. There are no dependencies considering the time of the existence of an RCS on the one hand, and an indicator of high/less activity of an RCS on the other hand. Among the very active RCSs are schools established in 2005 and also two RCSs established in 2012. The situation is similar with regard to less or moderately active RCSs. Therefore, the time of existence of the RCSs could not be evaluated as a factor influencing the activity of RCSs.

The first part of the Results section is focused on the identification and evaluation of conditions for the development of RCSs in the Czech Republic. It is useful to start with the funding of RCSs, because financial aspects are (according to Community Coordinators) the most important for the sustainable development of RCSs and community education in general.

Funding Source	Funding of RCSs (% of RCSs)	
	Very active RCSs	Less active RCSs
One-source funding	25.0	50.0
Multi-source funding	75.0	50.0
Specific:*		
Course fees	87.5	87.5
Municipality	50.0	50.0
Projects	25.0	12.5
Others (e.g. primary school, Region NUTS 3)	25.0	25.0

* more possible answers

Table 1: Funding of RCSs, 2015-2016 (source: own research)

Table 1 depicts the main funding sources of RCSs and a comparison of very active and less active RCSs with regard to the usage of various funding sources. Considering the type of funding, one-source funding prevails at less active RCSs and multi-source funding at very active RCSs. If Community Coordinators declare one-source funding, this means mainly course fees and rarely funding from the municipal budget. Course fees are also the most frequent funding sources. This indicates self-sufficiency of RCSs, regardless of their level of activity. However, very active RCSs rather use multi-source funding and course fees are supplemented by projects (funded by EU regional policy) and funding from the municipal budget. This indicates increased fund-raising activities and, on the other hand, also utilisation of social capital during negotiations with local government, which supports RCSs. Considering the development of the type of funding, there is an obvious shift from multi-source funding to one-source funding (mainly course fees) at less active RCSs. Therefore, decreasing activity of RCSs is detectable not only with regard to supplied courses but also with regard to funding activities.

Education/RCSs	Education and RCSs as important part of municipal development strategy (average rate)*	
	Very active RCSs	Less active RCSs
Education in general	2.00	1.29
RCSs	2.50	3.66

* Are education/RCSs considered as an important part of municipal development strategy? (1 = most important, 5 = least important)

Table 2: Education and RCSs as important part of municipal development strategy, 2015-2016 (source: own research)

One of the most important conditions for the development of RCSs is the strategic approach of local government to education and especially to RCSs. Table 2 depicts data on the evaluation of the importance of education and RCSs within strategic municipal documents. The data show that education in general is considered as an important part of municipal development strategies. Surprisingly, greater importance of education is observed within municipalities where less active RCSs are located. Community education (particular RCSs) is considered as a less important part of municipal development strategies. It is the same for both very active and less active RCSs. However, the difference between the importance of education in general and community education is significantly greater with regard to less active RCSs (difference between average rates is 2.37). It is obvious that the importance of education in general within municipal development strategies is less significant for the successful and sustainable development (according to Hudeckova and Husak (2015) it means development which ensures functioning of RCSs regardless of project support or one particular person) of RCSs than the importance of RCSs within municipal development strategies. Community Coordinators of less active RCSs state that municipal development strategies emphasise education as a significant part of rural development, but local government prefers forms of education other than community education and RCSs. Therefore we can conclude that the attitude of local government to community education and RCSs is an important condition for the successful and sustainable development of RCSs (regardless of whether it is always linked to the funding of RCSs).

Other important conditions for the development of RCSs are the interest and involvement of local teaching staff within community education. Table 3 depicts data on the evaluation of the participation of local teaching staff in community education. The data show that interest and involvement of the Headmaster of the local school is generally higher than the rest of the teaching staff. This is especially valid for RCSs which are strongly personally connected to the local primary school. A comparison of very active and less active RCSs is quite surprising. Greater interest and involvement of teaching staff was identified at less active RCSs. However, the variance of answers is significantly lower than when considering the very active RCSs (the answers oscillate between 1 and 3). On the contrary, considering the very active RCSs the answers are usually extreme – the local teaching staff actively cooperates with RCS or ignores the existence of RCS within the municipality. It is obvious that involvement of local teaching staff within community education is not very important with regard to the activity or inactivity of RCSs. On the other hand, involvement of local teaching staff is evaluated as an important fact for the sustainable development of RCSs. This results from interviews with Community Coordinators. They evaluated the participation of local teaching staff in community education as significant for the functioning of RCSs. In particular, they positively evaluate cooperation with the Headmaster of the local primary school. Evaluation of the participation of other teaching staff is quite ambivalent. A small group of participating teaching staff is usually present and the rest of the teaching staff does not want to cooperate with RCSs. They usually do not want to work beyond their official working hours. However sustainability of RCSs is based mainly on extra working hours and the enthusiasm of the local teaching staff.

Type of staff	Interest and involvement of the teaching staff (average rate)*	
	Very active RCSs	Less active RCSs
Headmaster	2.25	1.86
Other teaching staff	2.75	2.13

* Evaluate interest and involvement of the teaching staff of local school to participate in community education. (1 = highest interest, 5 = lowest interest)

Table 3: Interest and involvement of the teaching staff, 2015-2016 (source: own research)
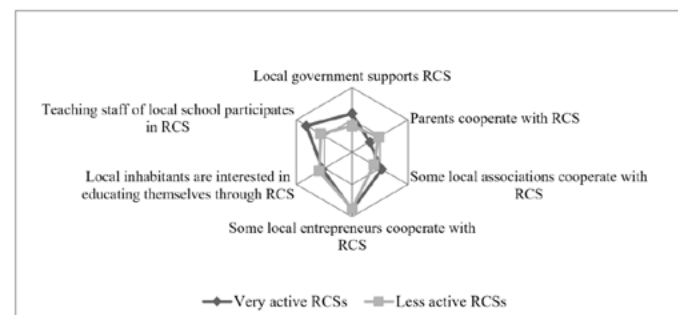
Note: Evaluate conditions for development of RCS within the municipality. (according to average rate; 1= strongly agree, 5= strongly disagree)

Figure 1: Spider Graph - Subjective endogenous conditions for development of RCSs, 2015-2016 (source: own research)

Spider graph (Figure 1) shows the subjective endogenous conditions for the development of RCSs. The data show that cooperation with parents of local pupils and chosen local associations is evaluated as the best. Cooperation with local entrepreneurs, who usually do not cooperate with RCSs in any way, is evaluated as the worst. Subjective endogenous conditions differ only slightly when considering the activity of RCSs. The data show that the most important factor for increasing the activities of RCSs is cooperation with the parents. On the other hand, cooperation with local government and local teaching staff is of less importance.
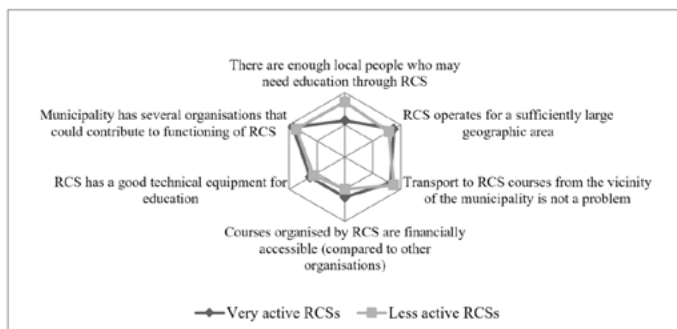
Note: *Evaluate conditions for development of RCS within the municipality.*
(according to average rate; 1= strongly agree, 5= strongly disagree)

Figure 2: Spider Graph - Objective endogenous conditions for development of RCSs, 2015-2016 (source: own research)

The spider graph (Figure 2) shows the objective endogenous conditions for the development of RCSs. The data show that technical equipment of RCSs, financial accessibility of courses organised by RCSs and sufficient amount of local people who may need education through RCSs are the best evaluated objective endogenous conditions. The evaluation of objective endogenous conditions is very similar considering very active and less active RCSs. There is one exception – the number of local people who may need education through RCSs. This factor is evaluated significantly better at very active RCSs. It is obvious that the demand by local people for education through RCSs is most important for increasing the activities of RCSs. On the other hand, financial accessibility of courses organised by RCSs is of less importance. There is the possibility for improved funding of RCSs and for a decrease of their dependence on the municipal budget.

The above analysed conditions for the development of RCSs are a prerequisite for their successful development. The development of various activities of RCSs in the Czech Republic is evaluated within the following part of the paper.

Table 4 focuses attention on the development of different types of courses (for a detailed distinction of the types of courses, see Husak and Hadkova, 2015) and other realised activities of RCSs – courses to increase opportunities on the labour market (A), courses with the mission of promoting active citizenship and local identity (B) and courses focused on the personal growth of participants (C).

Type of activity	Development of the activities of RCSs (% of RCSs)		
	Increase	Stagnation	Decrease
A	9.1	27.3	63.6
B	13.3	40.0	46.7
C	13.3	66.7	20.0
Others	10.0	70.0	20.0
Overall view	20.0	53.3	26.7

Table 4: Development of the activities of RCSs during their existence, 2015-2016 (source: own research)

The above-mentioned data depicted in Table 4 indicate the development of the supply of courses and other activities for potential participants. The supply of organised courses provided by RCSs shows stagnation or a significant decrease, in consideration of the courses to increase opportunities on the labour market and courses with the mission of promoting active citizenship and local identity. In only about 10 % of RCSs is the supply of courses increasing. There is a rather similar situation with regard to the supply of other activities (e.g. handicraft workshops, farmers' markets, occasional creative workshops, occasional discussions with local interesting people, trips to surroundings of the municipalities, Children's Day), which

supply stagnates in 70 % of RCSs. There is no difference (focusing attention on the structure of stagnant and decreasing RCSs) in the development of the supply of courses and other activities of RCSs, in consideration of the indicator of high/less activity. An increase of activities is possible to be observed only at very active RCSs (with one exception). The overall view provided by Community Coordinators of the development of activities of RCSs is also very interesting. The Community Coordinators of 20% of RCSs evaluate the development of activities of their RCSs as increasing, but if they pay attention to particular types of courses, the situation differs. Therefore Community Coordinators seem to be more optimistic in their evaluation of the development of RCSs than what the actual situation is when thinking about it in more depth.

Measure	Development of the demand for courses and other activities of RCSs (% of RCSs)		
	Increase	Stagnation	Decrease
Number of participants in organised courses	26.7	60.0	13.3
Number of participants in other activities	30.8	61.5	7.7
Others (e.g. information requests, queries)	46.7	40.0	13.3

Table 5: Development of the demand for courses and other activities of RCSs, 2015-2016 (source: own research)

Besides the supply side of the development of activities being the subject of the research, the demand side is also the centre of attention. The development of the demand for courses and other activities of RCSs is depicted in Table 5. Considering the development of the demand for organised courses and other activities, the situation of RCSs seems to be more positive than when considering the supply side. About 30 % of RCSs indicate an increase in the number of participants, both in organised courses and other activities. 46.7 % of RCSs observe an increase in the interest in RCSs shown in other ways. Community Coordinators specifically mention requests for information about RCS, queries about the mission of RCS and also co-partnership requirements for the organisation of local events. There is no difference (focusing attention on the structure of stagnant and increasing RCSs) in the development of the demand for courses and other activities of RCSs, when considering the indicator of high/less activity of RCSs. A decrease in the demand for activities is possible to be observed only at less or moderately active RCSs.

If we compare the supply and demand perspectives of RCS activities, it is possible to evaluate the development of RCSs as positive, due to the predominance of the increasing demand on the one hand and the decreasing supply on the other hand. The demand for the activities of RCSs is a crucial precondition for their future development.

Tools	RCSs using the particular tools (%)	from this (%)	
		Regularly	Occasionally
Web pages	100.0	87.5	12.5
Local newsletters	93.8	73.3	26.7
Leaflets	81.3	38.5	61.5
Others (e.g. Facebook, Primary School pupils, local radio)	37.5	66.7	33.3

Table 6: Promotional tools of RCSs, 2015-2016 (source: own research)

Because the increasing demand for the activities of RCSs is not obvious, it is also necessary to research the promotional tools used by RCSs. The promotional tools used by RCSs are depicted in Table 6 and are sorted in descending order, according to the

percentage of RCSs using the particular tool. All RCSs use web pages to inform the public of their activities; most of them regularly, and 12.5 % of RCSs use the web pages of a Primary School within the municipality for occasional information about their activities. The second position, which is also mostly used regularly, is that of local newspapers where RCSs usually have their own section. However, the use of local newspapers is strongly connected with close cooperation with the municipal council (see below). Leaflets are another promotional tool, which is generally used only occasionally for promoting current events organised by RCSs. However, the successful RCSs (very active) commonly use leaflets regularly. Their Community Coordinators state that, due to the social and age structure of the rural population, online communication and promotion are insufficient. Because there is no difference between the utilisation of the other promotional tools, when considering the indicator of the activity of RCSs, it is possible to evaluate the regular use of leaflets distributed to households or through local schools as a significant tool to support the development of RCSs. The other promotional tools are used only by a minority of RCSs and, despite the fact that they are mostly used regularly, there is no difference with regard to the indicator of the activity RCSs.

Local level		Supralocal level	
Partners	Cooperating RCSs (%)	Partners	Cooperating RCSs (%)
Municipal council	75.0	NNRCS	50.0
Local associations (NGOs)	62.5	Other RCSs	18.8
Primary School or Nursery School	18.8	Network of mother centres	12.5
Local action groups	12.5	x	x

Table 7: Main partners of RCSs, 2015-2016 (source: own research)

The promotion of RCS activities, as well as their collaboration with other organisations, both within the locality and outside the locality, are prerequisites for their successful development. Table 7 depicts the most frequent partners for RCSs, both at local and supralocal levels. The significantly most frequent partners at local level are municipal councils and other local associations, such as volunteer firefighters, Sokol association, hunting associations and others which are less frequent. The most important partner for RCSs at supralocal level is NNRCS. Other partners are only marginal, or only a few RCSs collaborate with them. However, not all partnerships may be considered as productive. A significantly higher proportion of successful (very active) RCSs actively cooperate with NNRCS. Therefore, this kind of cooperation may be classified as productive. On the contrary, collaboration with municipal councils provides possibilities for promotion in local newspapers (there is approximately the same proportion of collaborating RCSs as those RCSs who regularly use local newspapers for promotion – see above), but this could be classified as unproductive. This is because a higher proportion of less successful (less or moderately active) RCSs actively collaborate with municipal councils. On the other hand, according to Community Coordinators, for the long-term functioning of RCSs, if not collaboration, at least good relations with municipal councils are necessary. Collaboration with other local associations may be classified as neutral, because there is the same proportion of successful and less successful RCSs collaborating with them.

Discussion

The development of activities of RCSs within the Czech Republic is quite ambivalent. With regard to the researched RCSs, half of them may be classified as successful (very active with increasing or at least stagnant activities) and half of them may be classified as less successful (less or moderately active with decreasing or stagnant activities). Positive success factors (strengths) of the development of RCSs were identified as the increasing demand for courses and other activities of RCSs, regular use of personal and leaflet promotion (besides online promotional tools) and active collaboration with NNRCS. Negative failure factors (weaknesses) of the development of RCSs were identified as the decreasing number of realised courses, online communication as the only tool for promotion of RCS activities and unproductive cooperation with local municipal councils. However, according to Community Coordinators, cooperation with partners at local level is significantly improving. This is very important for future development of RCSs especially in context of significance of collaboration of RCSs with community and other local partners as stated by Oktari *et al.* (2015) in international context. In comparison with the first years after the establishment of of RCSs (Hudeckova and Husak, 2015), there are no local partners which could only with difficulty be partners to RCSs. This acknowledges the results provided by Kalenda and Smekalova (2015), who found a relationship between community education and a consensual approach (rather than a conflictual approach). According to Community Coordinators, the development of RCSs in the Czech Republic and their activities are based not only on cooperation with other local partners, but also on the activities of actor groups involved in community education in rural municipalities. This is especially important with regard to small rural municipalities with a higher proportion of personal relationships, not only in the rural areas of the Czech Republic but also abroad, as stated by Laudams (2013).

Endogenous subjective conditions prevail when considering the main conditions which influence the successful development of community education and RCSs in the Czech Republic. These are mainly multi-source funding, incorporation of RCSs and community education into municipal development strategy, and cooperation and involvement of parents in community educational activities. However, Biriescu and Babaita (2014) stated that in Romania are still more important objective conditions like financial aspects of educational courses, educational facilities, transportations problems and lack of modern information networks. Our research shows that situation in the Czech Republic is significantly different and similar to Anglo-Saxons conditions for development of RCSs (Heers *et al.*, 2011). The data show that only one endogenous objective condition is an important factor of RCS activities. This is specifically a sufficient number of people who wish to be educated through RCSs. The results are consistent with the evaluation of RCS activities as stated above and also acknowledged by Laudams (2013) in a broader perspective. The higher importance of subjective conditions for the development of community education is consistent with the studies provided by Lauerman (2010) with regard to the national context, and Heers *et al.* (2014) with regard to the international context. These studies mention in particular social (multiple partnership, social networks and social capital) and sociopolitical (increase of development potential of the whole community) aspects of the development of community education, which also match the subjective conditions.

Conclusion

The paper is focused on the development of community education within rural areas of the Czech Republic. Special attention is paid to the identification of objective and subjective endogenous conditions for the development of RCSs, activities, promotion and current partnerships of RCSs. The issue is topical due to the more than ten years' existence of the oldest RCSs in the Czech Republic and due to the emphasis on institutional and knowledge-based approaches in current rural development theories.

Considering the main results of our research, it is possible to state that subjective conditions prevail above objective conditions with regard to differences in the development of very active and less active RCSs. Convenient endogenous subjective conditions are the most important for the successful development of community education and RCSs in the Czech Republic. Results acknowledge that local networking, partnership and collaboration with the local municipality, parents and other local people are still more important than the technical aspects of RCSs. This is also reflected in the evaluation of the realised educational courses. There are significant differences between the development of the supply and demand sides of RCSs' activities. While the supply of courses and other activities is somewhat decreasing or stagnant, the demand for various activities is rather increasing. This is one of the most important factors influencing the development of RCSs. It also indicates that RCSs have established themselves as significant actors in rural education and rural development. The confidence of local people in RCSs, as illustrated by the increasing interest in their activities, may be evaluated as fulfilling the mission of RCSs for the first decade of their existence. The possibilities for the future development of RCSs are connected mainly with increased collaboration with other active local partners. The research shows that the best way how to support cooperation with local partners is to choose credible Community Coordinator, who has central position within local social network. As is apparent from our research, current partnerships (especially at local level) may be classified as unproductive or neutral – especially considering the less active RCSs. However, for the long-term successful existence of RCSs, cooperation within local networks is necessary.

An investigation into the possibilities for cooperation between RCSs, parents and municipalities within the framework of regional family policy at the municipal level is also the focus of our ensuing research.

Acknowledgements

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EFFECT OF THE USE OF COMPUTER-AIDED ASSESSMENT SYSTEM IN THE TEACHING OF MATHEMATICAL ANALYSIS WITH REGARD TO STUDENTS' APPROACHES TO LEARNING

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Highlights

- *Use of CAA system in teaching positively affects student's performance in final tests*
- *Approaches to learning do not affect student's overall results (only results in some partial tasks)*
- *When practicing in CAA, students with deep approach need fewer attempts to reach the required score*

Abstract

Computer-aided assessment systems are increasingly used in education for both formative and summative assessment. Example of such a system from the area of mathematics education is the platform Maple T. A. (Testing and Assessment), which was developed specially for assessment in mathematics. The paper is focused on the efficiency of the use of the Maple T. A. platform to students' performance in classes of mathematical analysis (calculus). For this reason, the pedagogical experiment was conducted on the first and later second year undergraduate students of teaching mathematics taking into consideration their approaches to learning and studying. The research results include cluster analysis of students' approaches to learning and studying and analysis of students' performance in their homework assignments and final tests.

Keywords

Approaches to learning and studying, Maple T. A., Computer-aided assessment, CAA

Introduction

CAA (Computer-Aided Assessment/Computer Assisted Assessment) is a common term for the use of computers in the assessment of student learning (Sangwin, 2013). Good CAA platforms can help to consolidate student understanding, to support self-directed learning and to make it easier for instructors to manage growing class sizes (Technical Whitepaper, 2015). Contrary to the common assessment platforms, the systems suitable for mathematics must have special functions used for testing mathematical knowledge. The specificity of assessment of students in mathematics involves use of mathematical symbols, equalities, numerical series or graphs. An example of such system is the platform Maple T. A. (Testing and Assessment), which was established by integrating computational capabilities of computer algebra system Maple to CAA system (Keady et al, 2006; Jones, 2008; Berkova, 2015). The presented paper is focused on the efficiency of the use of the Maple T. A. platform to students' performance in classes of mathematical analysis (calculus).

The effects of CAA systems have been the subject of several studies with diverse results. The CAA systems are used here mainly for student's homework and final exams. To name a few Hauk, Powers and Segalla (2015) as well as Allain and Williams (2006) did not find any statistically significant differences between final results of the students using CAA and students using paper and pencil for their homework. The differences were not discovered even by Demirci (2006). However, contrary to the previous studies there was a slight difference in favour of those students who were using the traditional pencil and paper for their homework assignments. On the other hand Love, Keinert and Shelley (2006) and also Burch and Kuo (2010) claim that the means of results of students who utilize online homework were higher than the means of students who used paper and pencil for their assigned homework.

Based on the review and the fact that the utilization of such systems in the Czech Republic is not widespread (according to survey in Berkova, 2014; Berkova and Kulicka, 2016) the author has decided to implement the CAA platform Maple T.

A. at the University of Hradec Kralove and observe the results of the utilization of this platform on the process of teaching mathematical analysis in the Czech educational environment. The area of interest included how the software will suit different types of students. Because of this, in the first part of the research the students were divided into characteristic groups based upon a questionnaire survey that was focused on the students' approaches to learning and studying. Students' approaches to learning and studying describe what students do when they go about learning and why they do it. The basic distinction is between a deep approach to learning, where students are aiming to understanding, and a surface approach to learning, where they are aiming to reproduce material in a test or exam rather than actually understand it (Entwistle, 1988; Ramsden, 1992; Biggs, 1999). For its quality, the ETL (Enhancing Teaching-Learning Environments in Undergraduate Courses) project's questionnaires were chosen to be modified and used in this research (Entwistle, 2005). The author of this paper managed to get approval from author professor Entwistle to use these instruments from the ETL project.

Let us summarize that the research dealing with the utilization of the Maple T. A. platform was conducted at the University of Hradec Kralove. The first year undergraduate students of teaching mathematics were divided into characteristic groups based upon their approaches to learning and studying. The students that were divided into these characteristic groups then underwent a pedagogical experiment. During the observed semesters, students' performance in homework and final tests was analysed to find whether there are differences depending on the forms of teaching (with or without the aid of CAA) and characteristic groups of students (according to approaches to learning).

The research questions were thus:

(RQ1) Do the achieved students' results differ in context to the form of teaching (with or without the aid of CAA)?

(RQ2) Is there a relationship between the students' approaches to learning and their achieved results?

(RQ3) Is the efficiency of the forms of teaching (with or without the aid of CAA) the same for students with different approaches to learning?

This paper is an extension and continuation of the previous conference proceeding focused on the efficiency of the use of the Computer-Aided Assessment system in mathematics presented on the 13th International Conference on Efficiency and Responsibility in Education (ERIE 2016) (Berkova, 2016). In the mentioned proceeding, answers to research questions were presented only using the results of the final summative tests. This paper provides more detailed view on the experiment through an analysis of the ongoing activities of students in formative homework assignments.

Materials and Methods

The research sample was composed of first (2013/2014) and later second (2014/2015) year undergraduate students at the University of Hradec Kralove which were attending the classes of calculus (Mathematical analysis 1, 2, 3). A total of 22 students between the ages of 18 and 20 participated in the study. To maintain anonymity, each student was given a number (Student 1, Student 2, etc.).

In the first phase, the Q1 questionnaire focused on students' approaches to learning and studying was created based on instruments from ETL project. The Q1 questionnaire consists of three main parts (see Figure 1a). The first one named Learning orientations is focused on the students' expectations and their goals in their university studies. It contains a total of seven questions. The second part is dedicated to the students' approaches to learning and studying. It has 17 questions. The final, third, part focused on students' preferences for different types of course and teaching has 8 questions. The second and the third part contain the added questions (6 questions) focused on the using of information and communication technology (ICT) or traditional techniques in education. Students answered by checking the answers on a scale 1-5 in all of the items. The Q1 questionnaire survey (Cronbach's Alpha 0.797966) was conducted in fall 2013/2014 in the subject Mathematical analysis 1. The results of the survey were evaluated using cluster analysis (division of students into characteristic groups).

For the detection of the efficiency of the CAA platform the experiment with repeated measurements has been selected, since the study group of 22 students was too small to conduct a classic experiment utilizing the parallel groups' technique. During the first semester of the experiment, the subject Mathematical analysis 2 (spring 2013/2014) was taught using the traditional teaching form utilized classical, in regards to homework mainly paper and pencil aids. The following subject Mathematical analysis 3 (fall 2014/2015) was taught with the aid of the new CAA mathematical platform Maple T. A. (experimental teaching). Lessons of the semester were always divided into four thematic areas. The students were in the end of both semesters given objectively scored cognitive didactics tests (T1 and T2) which were created in the Maple T. A. system. The T1 (Cronbach's Alpha 0.825213) and T2 (Cronbach's Alpha 0.853111) tests assessed the level of the students' knowledge in given thematic areas (8 questions) and mathematical apparatus and insight into the studied problems (8 questions). The items called mathematical apparatus and insight into the studied problems are focused on key knowledge from the students' previous studies which the students are not in proper semester primarily studying, but are essential for the study of mathematics itself (inequalities, limits etc.) and application of new mathematical theorems (see Figure 1b). Data from the experiment (students' performance in homework and final didactic tests) was evaluated using analysis of variance and other methods of data analysis.

a) Scales and items of Q1 questionnaire

1. Learning orientations
   (What do you expect to get from the experience of higher education?)
   Intrinsic orientation (3 item scale)
   Social and personal reasons (2 items)
   Career reasons (1 item)
   Lack of purpose (1 item)
2. Approaches to learning and studying
   Deep approach (9 item scale)
   Surface approach (4 items)
   Organised effort (4 items)
3. Preferences for different types of course and teaching
   Supporting understanding (4 items)
   Transmitting information (4 items)
   Using ICT (3 items)
   Traditional class (3 items)

b) Scales and items of didactic tests T1 and T2

1. Knowledge gained in the semester
   Each thematic area 2 items (8 items in total)
2. Mathematical apparatus and insight into the studied problem
   Inequalities (2 items)
   Limits (2 items)
   Basic arithmetic and geometric sequences and series (2 items)
   Understanding/application of new mathematical theorems (2 items)

Figure 1: Scales and items of used research instruments

Results and Discussion

Characteristic groups of students (Cluster analysis)

Clustering or cluster analysis is the process of grouping individuals with similar variable measurements (in our case with similar responses in Q1 questionnaire). Table 1 shows the results of this cluster analysis that gave rise to characteristic groups of students based on their responses in Q1 questionnaire according to their approaches to learning and studying. The results were analysed in the NCSS statistical software.

Cluster Means	Three Clusters			Four Clusters			
Variables	Cluster1	Cluster2	Cluster3	Cluster1	Cluster2.1	Cluster2.2	Cluster3
Intrinsic	3.52	4.27	3.00	3.52	4.44	4.19	3.00
Social_and_personal_reasons	3.18	3.55	2.00	3.18	4.17	3.29	2.00
Career_reasons	4.82	4.20	2.00	4.82	5.00	3.86	2.00
Lack_of_purpose	2.82	2.30	4.00	2.82	3.00	2.00	4.00
Deep_approach	3.13	4.00	2.22	3.13	3.85	4.11	2.22
Surface_approach	3.14	2.18	2.00	3.14	2.83	1.89	2.00
Organised_effort	3.45	3.68	2.50	3.45	3.67	3.68	2.50
Supporting_understanding	2.61	3.83	2.00	2.61	4.08	3.71	2.00
Transmiting_information	4.36	3.85	2.00	4.36	4.50	3.57	2.00
Using_ict	4.06	3.97	2.67	4.06	3.78	4.05	2.67
Traditional_class	3.45	3.67	2.67	3.45	4.44	3.33	2.67
Count	11	10	1	11	3	7	1

Table 1: K-Means Cluster Analysis Report (NCSS)

Firstly observe the part with the Three Clusters. Cluster3 is composed of only one student (Student 16). From the graph (Fig. 2a) it is evident that this particular student is someone with lack of motivation (highest score in the Lack of purpose item). An interesting fact is that Student 16 dropped out the university during the time of this research. Cluster1 is comprised of 11 students who have conclusively the highest score in the Career reasons in the Learning orientations section. In the area of the Approaches to learning and studying these students are ambivalent with the best score in the Organized effort subscale. Nonetheless, they are most clear in the area of

Preferred course and teaching types – they conclusively prefer teachers who are simply Transmitting information to teachers who Support understanding of the studied material. On the other hand, Cluster2 is apparently composed out of highly motivated students (high score in the Learning orientation section with a drop in the Lack of purpose item). These 10 students with high score in a Deep approach and low scores in Surface approach are evidently interested in more in-depth studying. Conversely, the students from Cluster2 do not have significant preferences in regard to the type of course and teaching and go down well with various types of being taught.
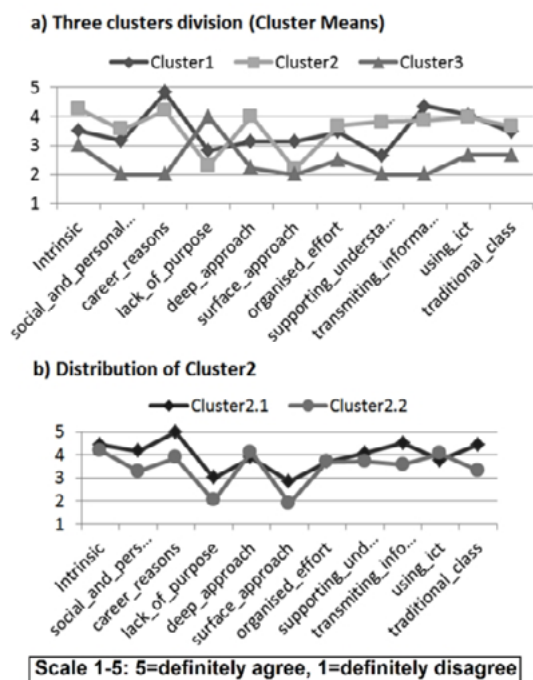

Figure 2: Graphical interpretation of cluster analysis

Because Student 16 from Cluster3 has dropped out after the spring semester 2013/2014, only two clusters remained for further evaluations. Because of this, it was decided to divide the students again using cluster analysis into four clusters (see the part with Four Clusters in Table 1). The results were interesting. Student 16 formed again his own single member cluster which was for the sake of clarity named again Cluster3. Students from the first cluster again formed Cluster1. Cluster2 has split into two groups (for the sake of clarity named Cluster2.1 and Cluster2.2). Cluster2.2 consists of 7 students, Cluster2.1 then consists of the 3 remaining students. Because Cluster2.1 only has 3 students, it has been decided to use the previous cluster division for further analysis, taking into account this finer division if it was necessary. As it can be seen in Fig. 2b the students in Cluster2.2 are more pronounced in regards to their Approaches to learning. Cluster2.1 is strongly motivated by career and furthermore slightly higher scores can be seen in the Transmitting information subscale. In regards to their Preferences for types of course and teaching, students from Cluster2.1 also prefer traditional, paper and pencil, educational methods over using information technologies. On the other hand, Cluster2.2 does prefer information technologies.

Students' performance in homework

Students' performance in homework was processed using Correlation analysis and Analysis of variance (respectively t-test). Correlation analysis is used to quantify the linear association between variables. As correlation measure, the Pearson's correlation coefficient and Spearman's rank correlation

coefficient were used. Analysis of variance (ANOVA) is a method of statistical induction used to determine the effect of independent variables on the dependent variable by analysing the differences among group means. In order to quantify the idea of statistical significance, the p-value is presented here. Assuming the truth of the null hypothesis (for example about equivalence of means), the p-value is the probability with which the obtained data supports the null hypothesis (Montgomery, 2001). If the p-value is less than the selected level of significance, the observed data are inconsistent with the null hypothesis and the differences are statistically significant. The selected level of significance was always 0.05. Despite the fact that normality of data distribution has not been rejected in this study, to increase validity of testing (Hendl, 2009) and because of the small sample of students, corresponding non-parametric tests comparing medians were also performed. NCSS program calculates parametric and non-parametric tests at the same time in most cases. On the contrary to mentioned quantitative methods, students' results in homework was also processed with Content analysis. This method seemed to be the most appropriate because different forms of submission of homework in traditional (paper) and experimental (electronic) semester cannot be easily compared (same assignment for all students in paper version instead of different assignments among students in electronic version, repetition of submission in electronic version etc.).

During both semesters of experiment, students submitted five homework assignments (70% of points were required in homework). Interestingly, students from Cluster1 had more difficulty getting used to work with the Maple T.A. system. However, this imbalance between the characteristic groups quickly settled and it seemed that all students priced possibilities offered by the system at the end of the semester. Content analysis of homework has also shown that the performance of students did not changed depending on the form of assignment submission. Students who submitted well prepared homework in a paper version usually did not have problem with electronic homework assigned in the Maple T.A. and conversely. This finding was confirmed by calculation the correlation coefficient between mean performance in paper and mean performance in electronic homework for each student. A moderate positive correlation has been shown (Pearson's correlation coefficient was 0.646179[1], Spearman's rank coefficient 0.621093).

In the second experimental semester, electronic assignments in Maple T.A. allowed to monitor work of students with the Maple T.A. system. In Figure 3, we can see the mean number of attempts performed in five homework per semester for each characteristic group of students (clusters). The differences in the number of attempts among characteristic groups was tested with ANOVA. It is obvious from the figure, that differences among characteristic groups are statistically significant. This finding was confirmed for both division into two clusters (Cluster 1, Cluster 2) and also finer division into three clusters (Cluster 1, Cluster 2.1, Cluster 2.2). Student 16 (Cluster3) could not be included in the report due to abandoning studies during the experiment. Achieved p-value was 0.013842[2] for division into two clusters and 0.024727[3] for three clusters division. The results show that students from Cluster 1 needed significantly more attempts to reach the required score (70% points) to complete their homework.

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1   Observed correlation coefficient was subjected to the significance test that showed significant correlation (p-value 0.002).
2   P-value 0.025588 in relevant non-parametric Mann-Whitney test.
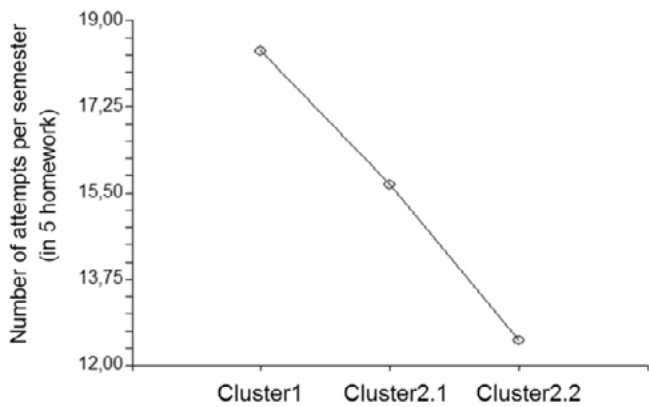3   P-value 0.039122 in relevant non-parametric Kruskal-Wallis test.

Figure 3: Graphical report (NCSS) of mean for appropriate clusters in numbers of attempts in homework assignments

Students' performance in final tests

From the described pedagogical experiment with repeated measurements, final data were gathered with the help of didactics test T1 (traditional teaching) and test T2 (experimental teaching). In this section, all research questions (*RQ1-RQ3*) were examined using two-way repeated measures ANOVA. As already mentioned, ANOVA is statistical method used to determine the effect of independent variables on the dependent variable. Repeated measures ANOVA is used when as in our case the comparative measurements are conducted on the same individuals (Littell, Henry and Ammerman, 1998). The independent variables are represented here as the teaching form (traditional/experimental) and the belonging to characteristic group (clusters according to student´s approaches to learning). The dependent variable was students' results in the didactic tests. In the two-way ANOVA approach, firstly the last third research question *(RQ3)* about the interaction of two independent variables is examined and if the interaction is not proven, then it is possible to continue with the testing of the main effects of these two independent variables – the effect of teaching form *(RQ1)* and the effect of approaches to learning *(RQ2)*. Let us now look at the two-way repeated measures ANOVA of the tests results (Table 2) for distribution of characteristic groups on the two clusters (Cluster1, Cluster2) and finer division into three clusters (Cluster1, Cluster2.1, Cluster2.2). Table 2 shows the p-values for the main items of didactic tests. As already mentioned, if the p-value is less than the selected level of significance α, then the effect of variable(s) is confirmed (as marked in the Table 2), otherwise it is not confirmed. The report was obtained again from NCSS statistical software[4].

At the significance level of 0.05, the interaction between independent variables (p-value 0.858300 or 0.795602 in AB line) has not been proven with the TOTAL results. Equally no differences were found between TOTAL results of the characteristic groups of students. Although, when taking into consideration the finer division of characteristic groups (three clusters), the influence of belonging to this characteristic groups on the TOTAL test results has been disapproved but by a slight margin (p-value 0.098016). On the other hand, the influence of the teaching forms has been shown as statistically significant in TOTAL results. Additionally, subsequently performed paired test confirmed these statistically significant differences for teaching forms in favour of the experimental group.

When looking on the subscales (Knowledge in thematic areas, New theorems, Inequalities, Limits and simple Sequences and series), more diverse results can be found. In the Knowledge

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4   Comparable results obtained in relevant non-parametric Friedman test.

subscale the results were the same as above, however in the New theorems subscale the influence of the belonging to characteristic group on the results of didactic tests has been proven (p-value 0.039644 for two clusters and 0.001688 for three clusters division). It is obvious that when talking about the TOTAL results, the students' approaches to learning are not showing themselves strongly. However, in regards to understanding of new mathematical theorems, the students from the Cluster2 are doing much better than from Cluster1. An interesting fact about the subscale labelled Inequalities is that if the students are divided into three clusters, there is not difference on the 5% significance level between experimental and traditional teaching form. Similarly, in the Limit subscale there has not been proven influence of teaching form on any of the students cluster divisions. Conversely, when taking into consideration the finer division (three clusters), the belonging to a characteristic group has expressed itself on the students' results in the Limit subscale (p-value 0.037685). Finally, among the simple Sequences and series the influence of the forms of teaching has been proven only with the two cluster division (p-value 0.024607).

P-values of ANOVA for division into 2 Clusters (Cluster1 and Cluster2)						
Source Term	TOTAL	Knowledge	New theorems	Inequalities	Limits	Sequences and series
A: Char_ group	0.504951	0.847457	0.039644*	0.567277	0.690005	0.098916
B: Teaching_ form	0.000000*	0.000003*	0.000380*	0.031573*	0.219917	0.024607*
AB	0.858300	0.791520	0.306041	0.567277	0.375957	0.913766
P-values of ANOVA for 3 Clusters (Cluster1, Cluster2.1, Cluster2.2)						
Source Term	TOTAL	Knowledge	New theorems	Inequalities	Limits	Sequences and series
A: Char_ group	0.098016	0.424697	0.001688*	0.849844	0.037685*	0.203744
B: Teaching_ form	0.000001*	0.000032*	0.000296*	0.132953	0.450212	0.058912
AB	0.795602	0.760237	0.366037	0.622538	0.674421	0.941662

* Term significant at alpha = 0.05

Table 2: Repeated Measures ANOVA Report (NCSS)

Let us now summarize the obtained results. It should be noted that the students' approaches to learning and studying do not have much influence on the final results and the knowledge the students' gained in a given semester. On the other hand, when talking about the understanding/application of new mathematical theorems, students interested in a deep understanding of the curriculum have better results. Further, the results of the students after completing the classes taught with the aid of CAA were significantly higher than the result of the students after the classes taught using the traditional approach. Finally, the efficiency of the forms of teaching was not different for students with different approaches to learning (no interaction was shown). The better results of experimental group were seen in all characteristic groups of students.

Conclusion

This paper informs about the research focused on the utilization of CAA when teaching Mathematical analysis (Calculus) at the University of Hradec Kralove (Czech Republic). The undergraduate students of teaching mathematics have undertaken a pedagogical experiment. Repeated measurements were carried out in two successive semesters to minimize the influence of the natural development of students as much as possible. Due

to this repeated measures approach contrariwise, the problem with imbalance of parallel groups was eliminated in contrast with other studies. In order to take into account the students' approaches to learning and studying, the students were divided into characteristic groups and when evaluating the results not only the teaching forms but also the characteristic groups of students were taken into consideration.

In response to previous studies mentioned in the introduction, which, however, differ in their conclusions and in which students' approaches to learning are not discussed, the positive effect of the use of CAA to student´s performance was clearly shown in this study. This positive effect was seen in all characteristic groups of students. Further, approaches to learning and studying do not affect student´s overall results but affect their performance in some partial tasks and mainly their way of practicing in the CAA system (students with deep approach to learning need fewer attempts to reach the required score in homework than students with surface approach).

Even though the research is limited by the small number of participating students and the fact that both traditional and experimental teaching forms were conducted by the author of the research, we believe that the conclusion of this paper can help lecturers when considering adding CAA system into teaching mathematics. The use of systems CAA should be taken into account also in connection with the downward trend in the field of mathematical knowledge of the first year undergraduate Czech students (as discussed in Kourilova and Bebcakova, 2015). Similarly, CAA system can be useful also in connected STEM subjects such as physics (Nemec, Berkova and Sramek, 2016a; 2016b). Related upcoming research as part of Ph.D. theses of the author is focused mainly on the opinions and experience of Czech students/teachers of mathematics with the CAA platform.

Acknowledgements

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ANALYSIS OF PROFESSORS' EVALUATION AT LA SALLE UNIVERSITY MÉXICO FROM 2010 TO 2016: WHAT THE RESULTS INDICATE?

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Highlights

- *System of professors' evaluation regarding teaching quality*
- *Results indicate low discrimination ability in the evaluation*
- *Significant differences in the evaluation requiring additional analysis*
- *Proposed structural changes within the evaluation system*

Abstract

La Salle University México (La Salle) uses an internal system of professors' evaluation, which main purpose is to evaluate professors' performance and secure high quality of teaching at all of its faculties. Since its inception in 2010, La Salle has obtained 517,635 individual evaluations of 45,346 courses. However, no additional analysis of the obtained results has ever been done. This article provides introductory analysis of the accumulated results at faculty level. The main objective is to analyze whether there are differences between faculties regarding the evaluation. Although the results are highly skewed towards the maximal evaluation at all faculties, there are statistically significant differences. The next important task is to investigate what factors influence the evaluation. Moreover, as this is the introductory analysis, the article concludes with possible future steps that should be consider regarding eventual structural changes in the evaluation system.

Keywords

Analysis of variance, Discrimination ability, Games-Howell test, Higher education, Professors' evaluation

Introduction

Nowadays, many universities introduce internal evaluations systems in order to secure and improve education quality. For this purpose, the use of students' evaluations of professors has become very common and popular. The aim of these evaluations is to measure professors' performance and quality. In most of the cases, the internal evaluation systems use online questionnaires with diverse set of questions divided into several areas (dimensions). The most common areas are educative, didactic and pedagogic. However, an evaluation system can also consider areas such as social and ethics, or teaching and learning (Hein, Kroenke and Rodrigues Júnior, 2015). The choice of areas and included questions usually correspond to a university strategy and culture, as well as to the main purpose of the evaluation. Usually, questionnaires include open-ended questions where students can express their opinions and/or attach comments related to the evaluation.

University authorities uses the results of professors' evaluations to secure a constant development of a teaching quality. Moreover, the results are used to solve teaching related problems, for a motivation of teachers for their personal development, as well as for hiring and promotion decisions (Becker and Watts, 1999). In Mexico, it is common that from elementary school until high school, professors are evaluated by their authorities and not by students. From bachelor level, students begin evaluating professors, and it is their first experience with an evaluation. Therefore, students at lower level do not have possibility directly influence quality of teaching. As the professors' evaluation is commonly anonymous, the idea is to obtain valuable information from students who have direct contact with a professor. Hence, students must not be afraid to

evaluate their professors. In this case, students must perceive the evaluation as a chance to be directly involved in teaching quality improvements at university. However, some problems may arise regarding the reliability of the evaluation. As Braga, Paccagnella and Pellizzari (2014) point out, students' objectives might be different from the university authorities. "Students may simply care about their grades, whereas the university cares about their learning and the two might not be perfectly correlated, especially when the same professor is engaged both in teaching and in grading." (Braga, Paccagnella and Pellizzari, 2014: 72)

In addition, any evaluation must consider specifics related to professors' evaluation. If the authorities seek to receive valuable information regarding teaching, the evaluation system must attract students' interest and needs (Brand Barajas, 2014). What is more, professors' evaluations are biased by gender and attractiveness of a professor (Basow, 2000; Felton et al., 2008; Silva et al., 2008). Usually, male and attractive professor receives better evaluation than female professor. In a similar manner, positive and negative evaluation is directly linked to students' interest about a course and the ease of the course (Leung, Jiang and Busser, 2013). The higher the interest is, the better the evaluation is. On the other hand, the ease of a course can have both a positive impact, as well as negative impact on an evaluation (Felton et al., 2008, Marsh and Roche, 2000).

La Salle University México (La Salle) uses System of professors' evaluation (called SED 2.0) to evaluate professors' teaching quality at the end of each semester at bachelor level. The second version of the system was launched in 2010 and the first results of the evaluation were obtained the same year in December (related

to semester August-December). Nowadays, the authorities of La Salle have access to a valuable database containing more than 500,000 individual evaluations throughout 13 semesters of SED 2.0 history. Although this valuable database exists, no complex statistical analysis of the data has been provided. As consequence, no information about the relations within the evaluation exists. As the authorities seek to secure and improve teaching quality at La Salle, it is important to provide analysis of the current state of nature. Similarly, before starting changing the current evaluation system, it is necessary to analyze and understand current inter-relations within the system.

The objective of this article is to analyze whether significant differences in the evaluation exist between faculties at La Salle University México. For this purpose, we analyze results from the SED 2.0 using data from the period 2010 - 2016. Additional objective is to propose future recommendations regarding SED 2.0 based on the gained results.

The article is divided as follows: We begin with a brief introduction into the systems of professors' evaluations. In the following part, we describe evaluation system that is currently used at La Salle, describe the dataset, as well as methods used in the analysis. Further, we continue with detailed explanation of results, followed by a discussion over the achieved results. We conclude the article by some perspective for future research.

Materials and Methods

Evaluation system SED 2.0 (Sistema de Evaluación Docente)

Evaluation system SED 2.0 was created at La Salle University México in 2001. The purpose of the creation was a necessity to evaluate professors' performance in a fast, safe and reliable way according to the institutional philosophy centered on a person and his/her integral training. SED 2.0 is maintained by Department of Teacher Education (DPE), i.e. DPE maintains its design, development, results dissemination, etc.

The first version of SED, instrument for professors' evaluation by university students, was created in 2001. This system consisted of 30 questions, which were divided into 5 separate areas: self-evaluation (5 questions), interaction (8), intervention (10), professional (2), and administration (5). In 2010, the system was upgraded to the current version SED 2.0 in order to promote institutional flexibility, integration of cross-curricular subjects into all study plans and curricula known as the Common area (common courses taught throughout all study plans), as well as to update the Institutional Educational Model (IEM) and to promote the educational mission at La Salle.

Evaluation system SED 2.0 includes 3 areas: institutional, educative, and pedagogic. The objective of the institutional area is to evaluate professor's profile from the Lasallian mission (La Salle, 2017). This area applies to all professors of study programs with Recognition of Official Validity of Studies (ROVS). The indicators included in this area are related to personality, community and society. The objective of the educative area is to professor's profile based on abilities of student's graduation profile. Similarly, this area also applies to all professors of study programs with ROVS differentiated by education level (high school, bachelor level, and master level). The indicators included in this area are related to professor's ability of problem solving, social responsibility, ethical judgement, usage of ICT, efficient communication, and information management. The objective of the last are, pedagogic, is to evaluate professor's profile based on his/her capability of learning and teaching. This area applies to all professors of study programs with ROVS differentiated

by education level and type of a course, such as common area, laboratories and workshops, courses of initial phase (first two years), and courses from final phase (last 2 years). (Coordinación de Formación Docente, 2010). The current version of the system consists of 15 questions: institutional area (3 questions), educative (6) and pedagogic (6).

Every student evaluates anonymously all his/her professors from all current courses at the end of each semester. For this purpose, a scale consisting of five options (Never – Almost never – Sometimes – Almost always – Always) is used in the evaluation in each of the three areas. The obtained scores are then transformed to a scale 0-10pts, quantifying the qualitative scale[1]. Students can also add additional comments related to either evaluated subjects, or to administration of studies. The approximate time to finish the evaluation is around 20 minutes. The evaluation is fully available online. Thus, students can make their evaluations at any computer at the university campus, at home, as well as using their mobile phones. The evaluation is opened for 12 days at the end of each semester. During this period, a classroom with 40 computers is reserved at the university especially for the evaluation. What is more, the responsible persons to the evaluation make daily reports to inform the deans of each faculty about the progress in the evaluation (percentage of participation by each study program and group of students).

No more than 10 days after the evaluation, the representatives from DPE deliver the official results to each faculty. The official results include quantitative data (frequencies and evaluation of each professor and each course), qualitative data (students' comments about each professor and about each course), as well as historical data (evaluations and comments since 2010). Every professor has a possibility to revise his/her anonymous evaluation (quantitative and qualitative) on the internet during the first month of the next semester.

Data

La Salle University México is based in Mexico City, Mexico. Nowadays, the university includes 7 faculties in area of higher education: Mexican School of Architecture, Design and Communication; School of Chemistry; Law School; School of Humanities and Social Sciences; School of Engineering; Mexican School of Medicine; and Business School. Apart of the area of higher education, La Salle University México includes High School and Post graduate studies and Research department. In the academic year 2015/2016, 12,493 students were enrolled in all levels, from which 6,173 students were enrolled in bachelor study programs at all its entities (La Salle, 2016).

In this article, we analyze 517,635 individual evaluations provided by bachelor students between period December 2010 (semester August-December 2010) and December 2016 (semester August-December 2016), i.e. through 13 semesters since the inception of the evaluation system SED 2.0. Table 1 summarizes distributions of the evaluations within the university. These distributions summarize all three areas (institutional, educative and pedagogic) included in SED 2.0. Once the students enter the system, they always terminate the evaluation in all three areas. There is no case, when the evaluation is incomplete. Analyzed 517,635 individual evaluations from SED 2.0 refer to 45,346 professors' evaluations (courses evaluations) throughout the period in question. Table 2 summarizes the descriptive

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1   Each qualitative evaluation is first quantified to a scale 0-4pts, where "Always" corresponds to 4pts. Second, the quantified scale is multiplied by 2.5 to obtain an evaluation on a scale 0-10pts.

statistics of the analyzed sample. In all cases, the results indicate very high average varying from 8.81 at Business School to 9.14 at School of Chemistry in Institutional area, from 8.55 at Business School to 8.99 at School of Medicine in Educative area, and from 8.85 at Business School to 9.1 at School of Medicine in Pedagogic area. The university average is 8.93 in Institutional area (SD of 1.31), 8.72 in Educative area (SD of 1.41), and 8.97 in Pedagogic area (SD of 1.3). Figure 1 summarizes the average evaluations from SED 2.0 for all three areas regarding the whole university and all faculties.

	dec-10	jun-11	dec-11	jun-12	dec-12	jun-13	dec-13	jun-14	dec-14	jun-15	dec-15	jun-16	dec-16
University	36,868	36,383	37,391	36,545	42,190	36,653	43,189	40,200	44,034	41,448	38,500	40,866	43,368
School of Architecture	7,617	7,596	7,410	7,461	9,016	7,880	9,525	9,365	9,848	8,728	8,301	9,239	9,468
School of Chemistry	2,781	2,525	3,364	2,859	3,098	2,307	4,019	3,218	4,067	2,972	3,417	3,003	3,290
Law School	4,138	4,641	5,034	4,898	5,664	5,533	6,440	5,418	6,002	6,303	5,673	5,629	6,221
School of Humanities	2,807	2,717	3,071	2,874	2,905	2,879	2,869	2,964	2,894	2,822	2,343	2,544	2,359
School of Engineering	4,713	3,985	5,180	3,850	5,810	4,495	5,727	4,949	6,041	5,026	5,233	5,195	6,294
School of Medicine	8,022	8,237	5,999	7,525	7,834	6,278	5,991	6,038	6,033	6,439	5,240	5,731	5,279
Business School	6,790	6,682	7,333	7,078	7,863	7,281	8,618	8,248	9,149	9,158	8,293	9,525	10,457

Table 1: Number of evaluations in total, La Salle, December 2010 – December 2016

Regarding Kolmogorov-Smirnov test, the data does respect the normality on confidence interval 95% in all three evaluated areas total, as well as considering each faculty individually as $p = .000$. Therefore, Welch-ANOVA is used to analyze differences in the evaluation between faculties at La Salle Univesity México.
The objective of the article is to analyze results from SED 2.0 and get insights into this evaluation. For this purpose, we work with the following three hypotheses:

- H_0 – There is no difference in the evaluation with respect to Institutional area and university faculties.
- H_0 – There is no difference in the evaluation with respect to Educative area and university faculties.

- H_0 – There is no difference in the evaluation with respect to Pedagogic area and university faculties.

The difference in the SED 2.0 evaluation regarding to all three hypotheses is evaluated with respect to mean values and variances.

	N	Institutional		Education		Pedagogic	
		Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
University	45,346	8.932	1.315	8.724	1.419	8.970	1.305
School of Architecture	6,766	8.985	1.186	8.859	1.225	9.007	1.152
School of Chemistry	3,561	9.145	1.230	8.966	1.381	9.056	1.657
Law School	4,413	8.984	1.326	8.805	1.373	8.941	1.327
School of Humanities	3,536	8.944	1.355	8.649	1.519	8.912	1.362
School of Engineering	10,618	8.877	1.354	8.650	1.472	9.040	1.242
School of Medicine	3,919	9.121	1.106	8.992	1.156	9.104	1.103
Business School	12,533	8.810	1.396	8.553	1.510	8.852	1.345

Table 2: Descriptive statistics of SED 2.0 evaluations, La Salle, December 2010 – December 2016 (own calculation)
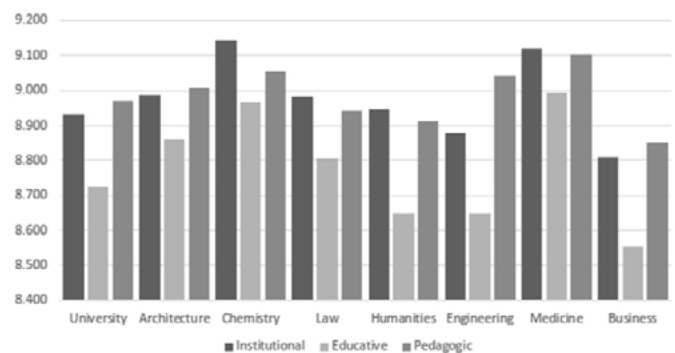
Figure 1: Average evaluation by area and faculty, La Salle, December 2010 – December 2016

Analysis of variance and Games-Howell test

The main objective of the article is to analyze results from SED 2.0, i.e. whether there are differences in the evaluation regarding university faculties. For this purpose, we use analysis of variance (ANOVA) with a single factor. We suppose that $x_1,...,x_n$, $y_1,...,y_m$ and $z_1,...,z_m$ are independent samples with mean values μ_x, μ_y and μ_z. Further, we suppose that their correspondent variances σ_x^2, σ_y^2 and σ_z^2 are known. We then test following hypothesis

$$H_0 : \mu_x = \mu_y = \mu_z$$

to obtain global significances (Triola, 2012).

If ANOVA indicates statistically significant differences within the analyzed sample, we can apply post hoc test to discover between which groups these differences exist. As the data do not have normal distribution, group sizes are unequal and the variances are not equal, Games-Howell test is applied (Games and Howell, 1976). The Games-Howell test uses formula for Welch's approximate degree of freedom to obtain approximate confidence interval for the difference between two means based on student's *t*-test. We use IBM SPSS Statistics 22 for the analysis.

Results

The main objective of the article is to analyze the results of SED 2.0 evaluation, i.e. to understand more what information we can obtain from the evaluation. Nowadays, no deeper analysis about the obtained results is provided. As it was stated in Materials and methods, the Department of Teacher Education (DPE) delivers the official results to each faculty, which are in some cases forwarded to each professor. This transfer of the results is, in most of the cases, done by head of each study program.

However, sometimes, this transfer is not done and some professors do not receive his/her evaluations. Similarly, in some case, professors only receive their overall score (usually aggregated evaluation supplemented by separate evaluations from each of the three areas). However, this evaluation does not include either any additional information (e.g. comparative threshold within a study program), or any recommendations and comments from a head of the study program. Thus, the obtain information has lack of added value. In this article, we provide additional analysis of the results to provide better insights into the evaluation.
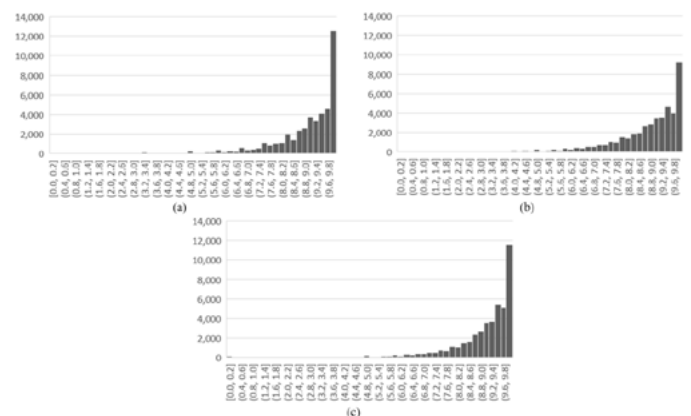
Distribution of evaluations

Regarding the scale used in the evaluation (Never – Almost never – Sometimes – Almost always – Always) and its transformation to 0-10pts scale, the obtained averages indicate very positive students' perceptions about professors' teaching quality. Figure 2 shows distributions of evaluations in each area. As we can see, the distribution is significantly skewed to right side (Institutional skew -2.401, Education area -2.15, and Pedagogic area -2.759), i.e. up to the maximum evaluation. When SED 2.0 was created, the expected distribution was rather a normal distribution. The representatives of La Salle University México believed that students would use the whole scale of the evaluation and would more discriminatively express their opinions about the teaching quality.

However, as it is seen in Figure 2, students in most of the cases use highly positive evaluations. Thus, the results of SED 2.0 indicate high teaching quality at La Salle without any problems related to the evaluated areas. The distribution of the evaluations (Figure 2) corresponds to distributions at all its faculties (see Appendix and Figure 3 to Figure 9). The pattern of distributions is skewed to the upper bound of the evaluation (10pts). As a result of this, the most common obtained evaluation in all three areas is the maximal 10pts. In average, 21.038% of evaluations in Institutional area are equal to 10pts (Table 3). Similarly, as the distribution is very similar in Educative and Pedagogic areas, 13.662% of the evaluations in Educative area and 16.689% in Pedagogic area are equal to 10pts (Table 4 and Table 5).

This result can be explained in two possible ways. First, students perceive that teaching at La Salle is of a high quality and, thus, evaluate their professors by the maximal evaluation. However, this might not be the case, as deeper analysis of students' comments included in some evaluations do not support this

idea. In some cases, students refer to various types of problems related to their classes. Rather, second, the maximal evaluation can be explained by students' behavior in evaluation, as in many cases students complete the evaluation as quick as possible without deeper thinking. Moreover, in many cases, if a professor is popular, then receives higher evaluation in all questions. On the other hand, professor without authority (or unpopular) receives lower evaluation. As, nowadays, the evaluation is not optional, and in many cases students are obliged to evaluate their professors, they use pure 10pts in every question. However, this presumption (although it is based on personal professors' and students' experience) must be verified with upcoming research. To support this fact, Table 3, Table 4 and Table 5 provide an information regarding cumulative frequencies in all three areas. For example, in the Institutional area, 92.288% of the evaluations at La Salle are greater than or equal to 7.0, and full of 63.589% of evaluations are greater than or equal to 9.0 (Table 3). This result is similar in the other two areas. We must admit that there might not be anything wrong about these results. Students might feel that it is common to evaluate each professor positively. In this case, evaluation around 7pts and 8pts can be perceived as neutral evaluation, and 6pts as negative evaluation. This students' perception can be connected to grading practice at La Salle University México. At each course, students pass a course when they achieve grade between 6 and 10. If students achieve 5 and lower, then they are obliged to paid and pass extra exam at the end of a semester. Therefore, common higher evaluation in SED 2.0 can be seen as common practice, as students do not consider lower points than 5 or 6.

Figure 2: Distribution of evaluations in a) Institutional, b) Educative, and c) Pedagogic area, La Salle, December 2010 – December 2016

	≥1.0	≥2.0	≥3.0	≥4.0	≥5.0	≥6.0	≥7.0	≥8.0	≥9.0	=10
University	99.775%	99.667%	99.365%	98.893%	98.196%	95.980%	92.288%	83.694%	63.589%	21.038%
School of Architecture	99.808%	99.719%	99.527%	99.113%	98.478%	97.177%	94.118%	86.580%	64.972%	15.268%
School of Chemistry	99.719%	99.663%	99.495%	99.186%	98.512%	96.883%	94.019%	87.840%	73.069%	27.268%
Law School	99.728%	99.569%	99.230%	98.822%	98.323%	96.102%	92.341%	85.203%	66.327%	21.641%
School of Humanities	99.802%	99.717%	99.463%	98.727%	97.936%	95.532%	91.714%	82.834%	64.791%	23.727%
School of Engineering	99.717%	99.652%	99.331%	98.898%	98.248%	95.592%	91.552%	81.870%	60.586%	25.118%
School of Medicine	99.974%	99.923%	99.592%	99.311%	98.648%	97.474%	95.024%	88.620%	71.192%	11.789%
Business School	99.769%	99.593%	99.218%	98.628%	97.798%	95.021%	90.720%	80.675%	59.012%	20.849%

Table 3: Cumulative distribution of evaluations in Institutional area, La Salle, December 2010 – December 2016

	≥1.0	≥2.0	≥3.0	≥4.0	≥5.0	≥6.0	≥7.0	≥8.0	≥9.0	=10
University	99.740%	99.581%	99.142%	98.492%	97.279%	94.727%	89.968%	79.076%	55.498%	13.662%
School of Architecture	99.793%	99.719%	99.453%	99.010%	98.256%	96.645%	93.187%	83.314%	58.838%	10.508%
School of Chemistry	99.719%	99.663%	99.495%	99.186%	98.512%	96.883%	94.019%	87.840%	73.069%	27.268%
Law School	99.819%	99.615%	99.298%	98.595%	97.598%	95.083%	90.709%	81.668%	58.441%	15.205%
School of Humanities	99.717%	99.491%	98.869%	98.020%	96.776%	93.241%	88.179%	76.867%	54.864%	14.027%
School of Engineering	99.652%	99.501%	99.077%	98.408%	97.080%	94.330%	88.802%	76.399%	52.439%	16.529%
School of Medicine	99.974%	99.898%	99.617%	99.388%	98.546%	97.193%	94.004%	85.813%	64.506%	5.869%
Business School	99.697%	99.497%	98.899%	98.037%	96.497%	93.385%	87.649%	75.010%	49.406%	12.934%

Table 4: Cumulative distribution of evaluations in Educative area, La Salle, December 2010 – December 2016

	≥1.0	≥2.0	≥3.0	≥4.0	≥5.0	≥6.0	≥7.0	≥8.0	≥9.0	=10
University	99.687%	99.570%	99.257%	98.754%	98.103%	96.266%	93.009%	85.328%	65.452%	16.689%
School of Architecture	99.867%	99.764%	99.453%	99.143%	98.611%	97.266%	94.561%	87.230%	65.888%	12.001%
School of Chemistry	98.315%	98.175%	97.922%	97.220%	96.883%	95.619%	92.951%	87.616%	74.221%	23.701%
Law School	99.751%	99.660%	99.207%	98.595%	97.915%	96.080%	92.182%	84.478%	64.355%	17.312%
School of Humanities	99.717%	99.548%	99.321%	98.699%	97.851%	95.164%	91.629%	83.937%	64.621%	16.770%
School of Engineering	99.774%	99.689%	99.454%	99.021%	98.437%	96.732%	93.907%	86.297%	67.037%	22.160%
School of Medicine	100.000%	99.898%	99.668%	99.439%	98.673%	97.117%	94.795%	88.951%	70.248%	6.022%
Business School	99.777%	99.633%	99.234%	98.612%	97.854%	95.628%	91.550%	82.390%	60.504%	15.687%

Table 5: Cumulative distribution of evaluations in Pedagogic area, La Salle, December 2010 – December 2016

Analysis of evaluations in Institutional area

First of all, we analyze whether there is a statistical difference between the analyzed groups, i.e. faculties at La Salle University. The F-value of 53.423 is statistically significant ($p = .000$) and the test of homogeneity of variances is also statistically significant ($p = .000$). Therefore, the differences between faculties are statistically different, i.e. at least one faculty has statistically different evaluation (Table 6). Further, Welch test is also statistically significant ($p = .000$) as degrees of freedom are quite different (Table 6), which is reflected by differences in standard deviations in the Institutional area (Table 2). As a result, we can reject H_0, as there is statistically significant difference between faculties regarding the Institutional area. As there is at least one statistically significant difference between faculties, we further apply Games-Howell test to analyze between which faculties the statistically significant differences occur.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	550.326	6	91.721	53.423	.000
Within Groups	77,841.953	45,339	1.717		
Total	78,392.280	45,345			
	Statistic	df1	df2	Sig.	
Welch	57.962	6	14991.349	.000	

Table 6: ANOVA analysis of SED 2.0 evaluations in Institutional area, La Salle, December 2010 – December 2016 (own calculation)

For the pairwise analysis of differences, we use the Games-Howell post hoc test, as the data do not meet the homogeneity of variances assumption. Table 7 summarizes results in the Institutional area. In majority of results, there are statistically significant differences between faculties, as the analysis of variance indicated. From the other point of view, there are

no differences between School of Chemistry and School of Medicine (average evaluation is 9.144, 9.121 respectively), which have the highest average evaluations from all faculties (Table 2). Further, there are no differences between School of Architecture, Law School and School of Humanities (8.983, 8.944 and 8.988) and between School of Humanities and School of Engineering (8.994 and 8.877). Last but not least, Business School has the lowest average evaluation in Institutional area (8.810). However, not significantly lower than School of Engineering or School of Humanities.

	School of Chemis-try	Law School	School of Hu-manities	School of Engi-neering	School of Medi-cine	Business School
School of Architecture	$p =.000$	$p = 1.000$	$p =.723$	$p =.000$	$p =.000$	$p =.000$
School of Chemistry		$p =.000$	$p =.000$	$p =.000$	$p =.978$	$p =.000$
Law School			$p =.844$	$p =.000$	$p =.000$	$p =.000$
School of Humanities				$p =.143$	$p =.000$	$p =.000$
School of Engineering					$p =.000$	$p =.004$
School of Medicine						$p =.000$

Table 7: Games-Howell test of SED 2.0 evaluations in Institutional area, La Salle, December 2010 – December 2016 (own calculation), significant at 5% level

Analysis of evaluations in Education area

In the Education area of the evaluation, ANOVA shows similar results as in case of the Institutional area. The *F*-value of 91.070 is statistically significant ($p =.000$) and the test of homogeneity of variances is also statistically significant ($p =.000$), as the differences between faculties are statistically different between each other (Table 8). Further, Welch test is statistically significant ($p =.000$) as degrees of freedom are quite different (Table 8). Therefore, we can reject H_0, as there is statistically significant difference between faculties regarding the Education area. As there is at least one statistically significant difference between faculties, similarly as for the Institutional area, we further apply Games-Howell test to analyze between which faculties the statistically significant differences occur.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1,087.641	6	181.274	91.070	.000
Within Groups	90,246.162	45,339	1.990		
Total	91,333.804	45,345			
	Statistic	df1	df2	Sig.	
Welch	99.639	6	14,984.614	.000	

Table 8: ANOVA analysis of SED 2.0 evaluations in Education area, La Salle, December 2010 – December 2016 (own calculation)

The post hoc test results in the Education area are summarized in Table 9. Similarly as in the Institutional area, there are statistically significant differences between faculties in majority of cases. There are no differences between School of Chemistry and School of Medicine (8.966 and 8.992), both with the highest average evaluations again (Table 2). Further, there is no difference between School of Humanities and School of Engineering (8.648 and 8.65) and School of Architecture and Law School (8.859 and 8.805).

	School of Chemis-try	Law School	School of Hu-manities	School of Engi-neering	School of Medi-cine	Business School
School of Architecture	$p =.002$	$p =.352$	$p =.000$	$p =.000$	$p =.000$	$p =.000$
School of Chemistry		$p =.000$	$p =.000$	$p =.000$	$p =.974$	$p =.000$
Law School			$p =.000$	$p =.000$	$p =.000$	$p =.000$
School of Humanities				$p = 1.000$	$p =.000$	$p =.016$
School of Engineering					$p =.000$	$p =.000$
School of Medicine						$p =.000$

Table 9: Games-Howell test of SED 2.0 evaluations in Education area, La Salle, December 2010 – December 2016 (own calculation), significant at 5% level

Analysis of evaluations in Pedagogic area

In the Pedagogic area, we get similar results as the *F*-value of 34.142 is statistically significant ($p =.000$) and the test of homogeneity of variances is also statistically significant ($p =.000$), as the differences between faculties are statistically different (Table 10). Further, Welch test is statistically significant ($p =.000$) as degrees of freedom are quite different (Table 8). Therefore, we can reject H_0, as there is statistically significant difference between faculties regarding the Pedagogic area. Thus, post hoc test can be applied to analyze between which faculties the statistically significant differences can be observed.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	347.462	6	57.910	34.142	.000
Within Groups	76,899.394	45,339	1.696		
Total	77,246.856	45,345			
	Statistic	df1	df2	Sig.	
Welch	35.166	6	14,744.893	.000	

Table 10: ANOVA analysis of SED 2.0 evaluations in Pedagogic area, La Salle, December 2010 – December 2016 (own calculation)

The following Table 11 summarizes the Games-Howell test results in the Pedagogic area. Although the results indicate statistically significant differences between most of the faculties, we can observe less significant results than in the previous two areas. There are no differences between School of Architecture, School of Chemistry, Law School and School of Engineering, as well as between School of Chemistry and School of Medicine, and School of Humanities and Business School.

	School of Chemis-try	Law School	School of Hu-manities	School of Engi-neering	School of Medi-cine	Business School
School of Architecture	$p =.707$	$p =.096$	$p =.007$	$p =.584$	$p =.000$	$p =.000$
School of Chemistry		$p =.014$	$p =.001$	$p =.998$	$p =.769$	$p =.000$
Law School			$p =.960$	$p =.001$	$p =.000$	$p =.002$
School of Humanities				$p =.000$	$p =.000$	$p =.241$
School of Engineering					$p =.042$	$p =.000$
School of Medicine						$p =.000$

Table 11: Games-Howell test of SED 2.0 evaluations in Pedagogic area, La Salle, December 2010 – December 2016 (own calculation), significant at 5% level

Discussion

The analysis of the obtained evaluations between December 2010 and December 2016 from SED 2.0 indicates positive perception of teaching quality at La Salle University México. The results show significant similarities in all three areas of SED 2.0, as well as between all faculties. We can accept the results with a conclusion of well-established evaluation system and positive teaching quality. However, there are several tasks that should be taken into consideration for future development of both SED 2.0 and teaching at La Salle. For example, how to increase discrimination ability in the evaluations and receive more accurate results.

First, we should consider reevaluating the current structure of SED 2.0, i.e. whether the evaluation structure in Institutional, Educative and Pedagogic areas is correct regarding students' expectations. For example, whether questions included in the system correspond with current students' needs, as it is of a high importance that an evaluation system complies with students' interest. As Brand Barajas (2014) pointed out, any evaluation must satisfy perfectly the objectives of the evaluation, as well as the necessities and interests of those who realize the evaluation (in our case the interest of students). Thus, the internal motivation and interest are the key feature to provide an evaluation of a high quality. According to McAuley et al. (2017), the top three most important motivators for students to finish an evaluation are: 1) to make course better, 2) earn bonus points, and 3) improve professor's teaching. On the other hand, the top three barriers to finish an evaluation are: 1) evaluate multiple professors, 2) complete several evaluations at the same time, and 3) complete lengthy evaluations. Regarding these findings, La Salle should consider changes in SED 2.0 structure that would deal with these motivators and barriers.

Moreover, besides structural changes in question, we can also consider changes in the evaluation scale in each question. The current version of SED 2.0 uses five-point scale (Never – Almost never – Sometimes – Almost always - Always) in each question. Obtained evaluation is then transformed to 0-10 points scale using a specific algorithm. As the discrimination ability is not satisfactory, a wider scale would provide results with better distribution within the evaluation scale. With a wider scale students may feel more freedom to express their opinions in the evaluation. However, as Flegl et al. (2017) investigated, wider scale does not necessarily need to lead to better discrimination within an evaluation. Students' behavior during the evaluation influences more the results than type of a scale. Thus, any changes in the evaluation scale must be carefully considered whether it would have a positive impact. Moreover, we still must keep in mind that any change must go along with the objective of the evaluation itself, as well as along with students' opinions. From this reason, we have prepared a questionnaire to investigate students' opinions about SED 2.0 and usefulness of the evaluation. This questionnaire was disseminated at all faculties in February, March and April 2017. According to our plan, the obtained results will be analyzed within the following months. If we gain valuable information of students' opinion about the system of professors' evaluation, then we can modify the current structure of the system and obtain more precise evaluation of each course later on. The more precise evaluations can be later used for improving teaching quality at La Salle. Consequently, precise results can serve to improvements of a course structure, as well as to professional development of a professor. As Marsh and Roche (1993) and Santibañez (2006) emphasize the improvement of teaching quality is directly connected to educative quality at an institutional level. Thus,

positive synergy in education process can be obtained at all parts of La Salle University México.

Second, connection between completion of the evaluation at the end of each semester and students' grading can also be considered. Nowadays, SED 2.0 is not connected to students' grading at all. Nevertheless, students are "obliged" to make the evaluation. So, a discussion can arise whether make the completion optional, free on each student's decision, and, somehow, connected to their grading. This change might have a positive effect, as well as negative one. Make the evaluation optional might directly lead to a drop in the total number of completed evaluations. Last year, SED 2.0 recorded 43,368 individual evaluations (Table 1) within a population of 6,173 students enrolled in bachelor study programs (four-semester long average of 41,046 individual evaluations). Potential drop can be significant in the following period after the change is made (hardly predictable). However, after the initial decrease, this drop can consolidate and the total number of completed evaluations can begin rising again. What is more, we might obtain better distributed evaluations as only those students interested in the evaluation would express their opinions about teaching quality.

In addition, to prevent the drop in the evaluations, we can consider connecting the optional evaluation to on-line publication of students' semester results (incentive for students). In this case, for example, only those students that complete the evaluation can be able to see their final grades on-line, i.e. accessible from outside of the university campus. On the other those, who do not complete the evaluation must come to university to see their final grades. This might be another stimulus for a completion of the evaluation. We can see this as an incentive, which will not improve grading obtained in courses during a semester. This possibility must be again carefully analyzed, as students can fill in the evaluation rapidly without deeper thinking just to have the option to see their results on-line.

Third, we should consider improving reporting of the results from SED 2.0. In the current system, there is no automatic reporting system, which sends professor's evaluation directly to a professor. The results are first proceeded by authorities at Department of Teacher Education, and after that sent to all heads of study programs. Unfortunately, not all heads of the study programs forward the evaluation to all professors. What is more, the information that is sent only includes overall evaluation (with anonymous students' comments if any) without any comparative threshold. Thus, this information lacks additional value that would serve as a base for potential teaching improvements. As Bolívar (2008) pointed out, if we do not have a synergy between different parts at university, then we cannot expect improvements in teaching quality. For example, if professors do not have valuable feedback regarding their evaluation, then there cannot be any improvement in teaching quality. Therefore, we should consider involving statistical analysis onto SED 2.0 to provide comparative evaluation thresholds. In this case, each head of a study program and each professor would be able to see how the evaluation ranks, for example, at a faculty. Having in hands comparative analysis, the representatives at university would offer specific feedback to professors, as well as additional training if needed.

Although we consider changing SED 2.0 in a way described above, we must always consider few specifics that influence professors' evaluations. The result of an evaluation depends mostly on students' interest about a course, the ease of the course and on gender of the evaluated professor (Leung, Jiang and Busser, 2013). The higher the interest is, the higher the evaluation is. Therefore, it is up to a professor to make a course

interesting for its students. Furthermore, as students evaluate their classes before the end of a semester, we must consider that expected course grade has also a large effect on the evaluation (Langbein, 2008). Students like to be satisfied, and they like higher grades. However, the ease of a course can have both a positive impact, as well as negative impact on an evaluation (Felton et al., 2008, Marsh and Roche, 2000). The evaluation depends on cultural aspects of a country and cultural aspects of a university.

Although the effect of ease of a course has an impact on the evaluation, this effect can be diminished by fairness grading procedure (Wendorf and Alexander, 2005). Thus, if students feel grading procedure is fair and sufficiently clear, then this fairness has bigger impact on professors' evaluation than the ease of class. Therefore, a perception about better evaluation in case of "easier" courses is not the unique influential factor in professors' evaluation. For example, gender of a professor has also direct impact on an evaluation. In general, male professors usually get higher evaluation (Basow, 2000). Similarly, the attractivity of a professor has positive effect on the evaluation (Felton et al., 2008, Silva et al., 2008). Considering all of these reasons, it is of a high importance to analyze all these effects on the professors' evaluation before initiating structural changes in the evaluation system.

Conclusion

The article deals with introductory analysis of the results of professors' evaluation at La Salle University México. As no additional analysis of the results had been created since the inception of the evaluation system (2010), this article provides the initial insights. At La Salle and its faculties, the evaluation is highly skewed towards the maximal evaluation of 10 points. In general, students evaluate their professors (courses) positively, which may indicate no problems regarding teaching quality. Approximately, 80% of the evaluations are greater than or equal to 8.0. However, students' additional comments included in the evaluation indicate several problems. This highly positive evaluation can have several reasons, such as common qualification scale used at La Salle (to pass a course a grade between 6 and 10 must be reached). Thus, students might not, unconsciously, be willing to evaluate professors at the whole scale.

Further, the analysis indicates statistically significant differences in the evaluation between faculties and, thus, research hypotheses were rejected. The highest average evaluation can be observed at School of Chemistry and Mexican School of Medicine. Nevertheless, statistically significant differences exist between more faculties. This introductory analysis is based on only one factor. To be able to explain reasons of these differences, further analysis focusing on effects that directly influence the evaluation must be done. The future research will focus whether factors such as gender, seniority, attractiveness, etc. have impact on the evaluation. Similarly, the future analysis will focus on the structural changes within the evaluation system towards new version SED 3.0.

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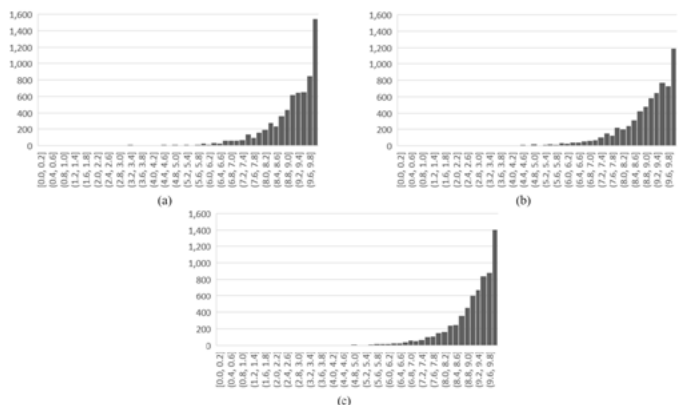
Appendix

Figure 3: Distribution of evaluations in a) Institutional, b) Educative, and c) Pedagogic area, School of Architecture, December 2010 – December 2016
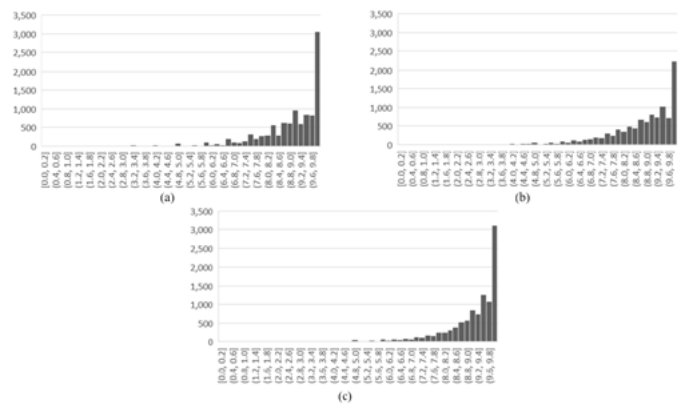

Figure 4: Distribution of evaluations in a) Institutional, b) Educative, and c) Pedagogic area, School of Chemistry, December 2010 – December 2016

Figure 5: Distribution of evaluations in a) Institutional, b) Educative, and c) Pedagogic area, Law School, December 2010 – December 2016

Figure 6: Distribution of evaluations in a) Institutional, b) Educative, and c) Pedagogic area, School of Humanities, December 2010 – December 2016

Figure 7: Distribution of evaluations in a) Institutional, b) Educative, and c) Pedagogic area, School of Engineering, December 2010 – December 2016
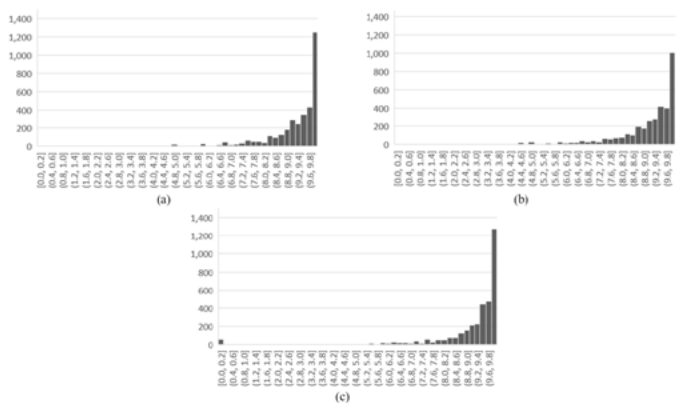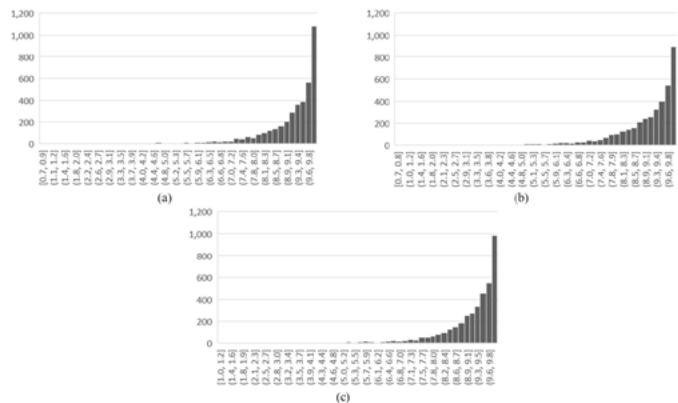

Figure 8: Distribution of evaluations in a) Institutional, b) Educative, and c) Pedagogic area, Mexican School of Medicine, December 2010 – December 2016
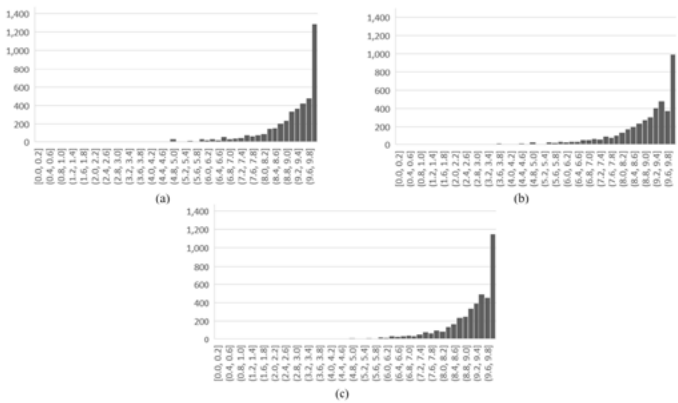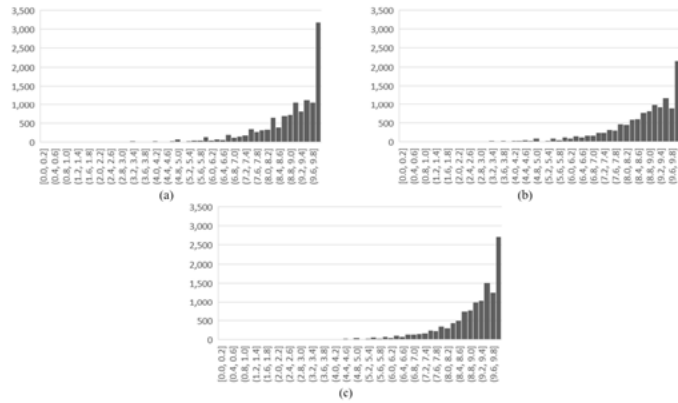

Figure 9: Distribution of evaluations in a) Institutional, b) Educative, and c) Pedagogic area, Business School, December 2010 – December 2016
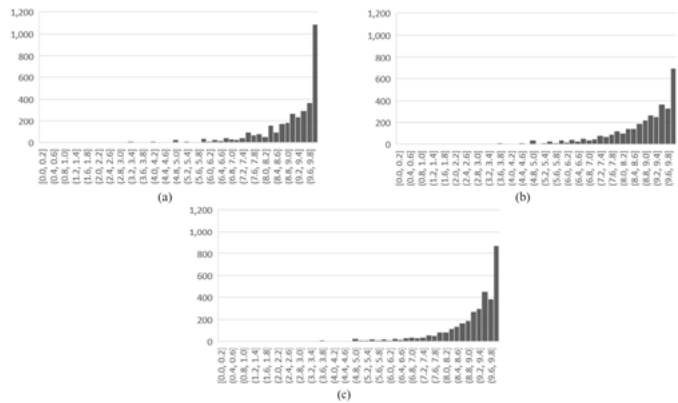
TEACHING METHODS IN MBA AND LIFELONG LEARNING PROGRAMMES FOR MANAGERS

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Highlights

- *Unique survey among managers on the teaching methods used during MBA and Lifelong Learning Programmes (LLP)*
- *Measuring the usefulness of selected teaching methods for participants' conceptual understanding of leadership, leadership skills development, and personal growth*

Abstract

Teaching methods in MBA and Lifelong Learning Programmes (LLP) for managers should be topically relevant in terms of content as well as the teaching methods used. In terms of the content, the integral part of MBA and Lifelong Learning Programmes for managers should be the development of participants' leadership competencies and their understanding of current leadership concepts. The teaching methods in educational programmes for managers as adult learners should correspond to the strategy of learner-centred teaching that focuses on the participants' learning process and their active involvement in class. The focus on the participants' learning process also raises questions about whether the programme's participants perceive the teaching methods used as useful and relevant for their development as leaders. The paper presents the results of the analysis of the responses to these questions in a sample of 54 Czech participants in the MBA programme and of lifelong learning programmes at the University of Economics, Prague. The data was acquired based on written or electronically submitted questionnaires. The data was analysed in relation to the usefulness of the teaching methods for understanding the concepts of leadership, leadership skills development as well as respondents' personal growth. The results show that the respondents most valued the methods that enabled them to get feedback, activated them throughout the programme and got them involved in discussions with others in class. Implications for managerial education practices are discussed.

Keywords

Leadership, learner-centred teaching, managerial education, teaching methods

Introduction

Managerial education and development takes place in formal programmes outside of the workplace as well as in informal training opportunities at work in a managerial position. Managers learn or adopt knowledge and skills that will allow them to carry out or improve their current or future professional roles (Sadler-Smith, 2006: 2). Studying for an MBA or in short-term lifelong learning programmes are examples of formal programmes. The teaching methods used in them have gone through certain changes that can be described briefly as a shift from teacher-centred to learner-centred teaching.

Learner-centred teaching focuses on the participants' learning process. The teacher's role is not to transmit knowledge from the instructor to the students, but to facilitate their learning. The emphasis is on using and communicating knowledge effectively to address enduring and emerging issues and problems in real-life contexts (Huba and Freed, 2000). This "facilitative" style of teaching creates an inspiring and psychologically safe environment in which learners explore the subject by themselves as well as in peer groups. This teaching style works best when learners already have prior knowledge of the subject as well as experience or existing skills (Beevers and Rea, 2010).

It's very important for managerial education to respect its participants' actual learning needs and provide them with learning opportunities that are clearly linked to their everyday work. Managers approach education (similarly to adult learners) in a more utilitarian way than students or undergraduate students. Teaching methods in managerial education should motivate participants to engage continuously in the learning process. They should also enable participants of the education programme to build upon their experience, reflect on it, and add theoretical background that will make them more effective in their managerial work and help them to develop their self-awareness (Waddock and Lozano, 2013).

Managerial education also focuses on developing leadership competencies and skills. Although management and leadership are different in many ways (Kotter, 1996), they also overlap. At the level of the individual, this means that managers are expected to provide leadership and to acquire leadership knowledge, skills, and abilities, i.e. competencies (Day and Dragoni, 2015). For organizations, competent leaders are one of the basic requirements of their survival in the turbulent conditions of the modern world. The topic of leadership is thus an integral part of managerial education, because organisations cannot afford to have managers without leadership competencies.

People in managerial positions tend to evaluate their leadership behaviour higher than when it's judged by their subordinates (see, for example, Mehdinezhad and Sardarzahi, 2015). Teaching methods in managerial education should thus provide participating managers with the opportunity not only to understand theoretical concepts and to develop specific leadership skills, but also to self-reflect and gain valuable feedback on their leadership behaviours.

Leadership could be defined as a "process whereby an individual influences a group of individuals to achieve a common goal" (Northouse, 2016: 6). For a leader to influence others, he or she must be a person that others are willing to follow. According to Hogan and Kaiser (2005), people seek four essential characteristics in leaders: integrity, judgement, competence, and vision. The most important of these characteristics is integrity, which creates trust between the leader and his or her followers. According to the above-mentioned authors trust in one's superior predicts the entire range of desirable organisational outcomes: productivity, job satisfaction, and organisational commitment (Hogan and Kaiser, 2005). Integrity must be understood as a personal trait of being honest with oneself and others; it's aligned with one's values system and ethic beliefs. It's also connected to the ability of self-insight, of being open to feedback and willing to perceive the wider context and consequences of one's behaviour.

In terms of the managerial education programmes, there are demands for them to contain ideas for the personal development of their participants that could contribute to a greater extent to their personal integrity and thus trustworthiness as leaders. According to Hall (2004: 154) „leader development is largely personal development" while a crucial aspect of personal development is self-awareness (Hall, 2004). Managerial learning thus should include not only the acquisition of relevant knowledge and skills, but also opportunities for increasing self-awareness.

Which of the teaching methods can be used to achieve this? One appropriate framework is the so-called whole person learning, which is an extended model of experiential learning (also known as Kolb's learning cycle) that has gradually been advanced since the 1980s. Whole person learning exposes participants in learning programmes to "both direct and vicarious modes of participation" and enables them „cognitively, emotionally, and behaviourally to process knowledge, skills, and/or attitudes in a high intensity learning situation characterized by a high level of active involvement" (Hoover et al. 2010: 195).

Managerial education programmes, such as the MBA or short-term LLP, should therefore use a wide spectrum of teaching methods that facilitate the cognitive processing and understanding of leadership concepts as well as the adoption of leadership skills, and encourage self-development. This is in accordance with Conger (1992), who suggested four primary approaches to leadership development: conceptual understanding, skills building, personal growth, and feedback.

This situation, such as it is described, raises questions on the methods used in management programmes for leaders' development and their frequency, relevance, and effectiveness. With regard to learner-centred focus, an important criterion of the evaluation of the teaching methods applied is the managerial education programmes' participants' own perception and assessment of those methods. These are important questions to ask in all managerial education programmes. In our study, we focused on managerial programmes realised by the International School of Business and Management (ISBM) of the University of Economics in Prague.

Therefore, the objective of the presented study was the analysis of the frequency and perceived usefulness of the teaching methods in the examined managerial programmes. The research questions were as follows: how frequently are the particular methods used in MBA programmes and short-term lifelong learning programmes (LLP)? What specific teaching methods did the participants in managerial education programmes, MBA

programmes, and short-term lifelong learning programmes (LLP) consider useful for the conceptual understanding of leadership, leadership skills development, and personal development? How does the frequency of the methods used differ from their perceived usefulness for different purposes (namely the conceptual understanding of leadership, leadership skills development, and personal growth)?[1]

Materials and Methods

The data used for this paper was collected within the Norway funds project on the basis of a questionnaire survey that took place in the spring of 2015. The respondents were participants of managerial education programmes (MBA and lifelong learning programmes) from both partner institutes involved in the project, i.e. the University of Economics, Prague (VŠE, CZ) and Sogn og Fjordane University College (NO). The collected results for both countries were first published at the EGPA Annual Conference in August 2015 (Bukve et al., 2015). For the purposes of this paper, only data for the Czech Republic was used, which were the answers of the participants of the lifelong learning and MBA programmes that are taught at the International School of Business and Management (ISBM) of the Faculty of Business Administration VŠE. LLP programmes are one-offs and tailored to their participants' needs (as part of company training) and are one-semester long. The length of study in the MBA programme is 2.5 years (a total of 90 ECTS). In order to approach the above-mentioned questions, we designed a survey. Prior to developing the survey, we identified the 14 different teaching methods used in the programmes under study. The list of methods is adapted from Daniel Jenkins's list of instructional strategies (Jenkins, 2013), taking into account the methods with relevance to the programmes under study. An appendix containing the definitions of all the relevant teaching methods was attached to the questionnaire to prevent misunderstandings. The methods were described as follows:

- Case study: participants examine written or oral stories highlighting a case of effective or ineffective leadership or managing organisation.
- Large group discussion: instructor facilitates sustained discussion, asks or answers questions concerning the given topic with the entire class.
- Interactive lectures: instructor presents information in 10–20-minute time blocks with periods of structured interaction and discussion between mini-lectures.
- Lectures: participants listen to instructor presentations lasting most of the class session.
- Reflective/experience writing: participants develop written reflections and analyses on their experiences (usually experience in the role of leader/ manager).
- Self-assessment questionnaires: participants complete questionnaires or other diagnostic instruments designed to enhance their self-awareness in variety of areas (e.g. communication style, personality type, leadership style, etc.).
- Role-playing: participants engage in activities where they act out roles according to a given scenario. The goal is to evolve the desired (managerial) skills.
- Small group discussions: participants take part in small group discussions on the topic of leadership or

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[1] This article is the expanded version of an article published at the ERIE 2016 conference (13th International Conference on Efficiency and Responsibility in Education 2016) held at the Czech University of Life Sciences in Prague. The data was then analysed further. It contains other results that weren't part of the conference article in 2016.

other aspects of managerial practice, sharing their own experiences.

- Feedback: participants receive feedback from the lecturer or their colleagues.
- Simulations, model situations: participants engage in activities simulating complex problems and requiring final decision-making (e.g. simulations of team decision making, meetings, etc.)
- Research projects: participants actively research a leadership theory or other topic and present findings in writing.
- Short written exercises: participants complete given sentences, answer written questions, etc. designed to enhance understanding of the course content.
- Exams, knowledge tests: participants complete tests or exams designed to appraise their level of understanding of the given topic.
- Oral presentations: based on individual or team preparation, participants present knowledge of the area of management or leadership in oral presentations to other participants.

Respondents were asked about how often the teaching methods were used in their programme, and how useful they found the methods for different purposes. In this paper, we analysed the teaching methods' usefulness for the conceptual understanding of leadership, the development of leadership skills and personal growth. These three purposes are based on Conger's primary approaches to leadership development (Conger, 1992), with the exception of feedback, which is included in the list of teaching methods (see above). The students filled out the questionnaires online (based on a link sent to them) or on paper, always after completing a course or a part of the programme devoted to leadership.

The overall number of completed questionnaires for the CZ was 54 (the response rate was 55%), of those 60.7% were women and 30.5% men. Most of the respondents were participants in lifelong learning programmes (66.6%), others were students of the MBA programme (33.3%).

Descriptive statistical characteristics were calculated in the statistical analysis of the collected surveys (mean, standard deviation, minimal and maximal values. Analysis was performed in statistical language R (R Core Team, version 2017). The differences between teaching methods were analysed by using within-subject ANOVA.

Results

The respondents were asked to report the frequency of the usage of each teaching method from the prepared list using a rating scale of 1 to 4 (1 = never, 2 = rarely, 3 = sometimes, 4 = often). The results are presented in Table 1.

The respondents found discussions in small groups (3.50), larger groups (3.35), and feedback (3.35) as the methods most frequently used in their type of training.

The frequency of the various methods used in teaching

Method	Mean	SD
Small Group Discussion	3.50	0.86
Large Group Discussion	3.35	0.91
Feedback	3.35	0.87
Interactive Lectures	3.26	0.96
Simulations, Model Situations	3.22	0.88
Case studies	3.19	0.97
Lectures	3.07	0.99
Role-Playing	3.02	0.98
Self-Assessment Questionnaires	2.98	0.94
Oral Presentation	2.69	1.04
Reflective methods	2.46	1.00
Exams, Knowledge Test	2.43	1.34
Short Written Exercise	2.30	0.96
Research Projects	1.74	0.94

Table 1: Frequency of the methods used in teaching, 2015 (source: own research)

The results of the survey of the frequency of the various types of teaching methods used in MBA and lifelong learning programmes at the University of Economics, Prague can be considered very encouraging (see Tab. 1). It can be said that traditional teaching methods such as lectures (3.07), exams, knowledge tests (2.43), and short written exercises (2.30) are techniques that are less frequently used compared to learner-centred interactive methods such as small/large group discussion (3.50/3.35), case studies (3.19), and interactive lectures (3.26). Due to the target group of learners, one can appreciate the emphasis on sharing and exchanging experience, especially through discussions, but even on the relatively often used tailored preparative activating methods, such as simulation (3.22), role-play (3.02), and case studies (3.19).

The analysis revealed that there are significant differences between the frequency of the usage of the individual methods; $F(13.6663) = 19.18$; $p < 0.001$. However, the post-hoc tests showed specific differences between the individual methods (see the graph of the average frequency of the usage of the individual methods, line segments designate the standard error mean).
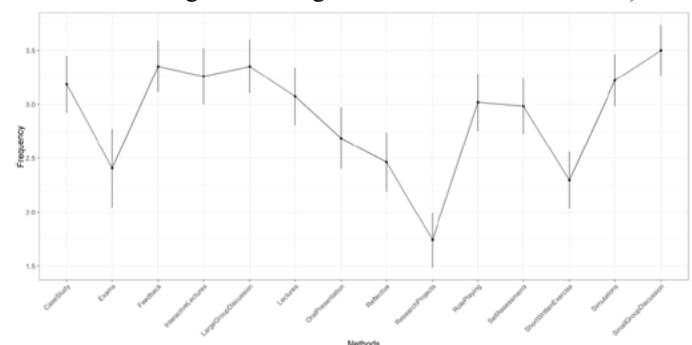
Figure 1: Average frequency of the usage of the individual methods (source: own research)

The further development of the effective use of the teaching methods can be undertaken in the field of so-called reflective methods that can, especially for managers with a lot of experience, significantly contribute to their further development as leaders. This is also supported by remembering to give feedback on activities carried out during full-time study as well as on homework assignments.

The usefulness of the methods for the conceptual understanding of leadership

Respondents were asked to evaluate the usefulness of the specific teaching methods for the conceptual understanding of leadership. They were provided with a five-level scale (from 1 = useless to 5 = very useful). See Table 2 for the results.

The respondents of our research have designated the so-called experience-based methods as the most useful for their conceptual understanding of leadership. These are, especially, feedback (4.52), simulations and model situations (4.50), small group discussion (4.33) and case studies (4.33). Short written exercises (2.94) and exams and knowledge tests (2.67) were seen as least useful for their conceptual understanding of leadership.

Method	Mean	SD
Feedback	4.52	0.72
Simulations, Model Situations	4.50	0.67
Small Group Discussion	4.33	0.80
Case studies	4.33	0.75
Role-Playing	4.19	0.95
Interactive Lectures	4.11	0.82
Oral Presentation	4.07	0.87
Large Group Discussion	3.96	0.89
Self-Assessment Questionnaires	3.80	0.96
Reflective methods	3.76	1.10
Lectures	3.59	1.11
Research Projects	3.07	1.18
Short Written Exercise	2.94	1.11
Exams, Knowledge Test	2.67	1.21

Table 2: The usefulness of the teaching methods for the conceptual understanding of leadership, 2015 (source: own research)

Small group discussion (4.33) and oral presentation (4.07) seem to be useful for the conceptual understanding of leadership, i.e. methods that include sharing experience, but also interactive lectures (4.11), which fittingly combine the instructor's contribution with a discussion and the experience and opinions of students and case studies (4.33)

Research projects (3.07), seldom used in this type of study programme, can be judged as useful. In contrast, the least useful according to the respondents are the methods from the group exams and knowledge testing.

There are significant differences among the represented methods in the assessment of their usefulness for the conceptual understanding of leadership ($F(13.689) = 27.08$; $p < 0.001$). Post-hoc tests revealed specific differences between the individual methods (see the graph below, line segments designate the standard error mean).
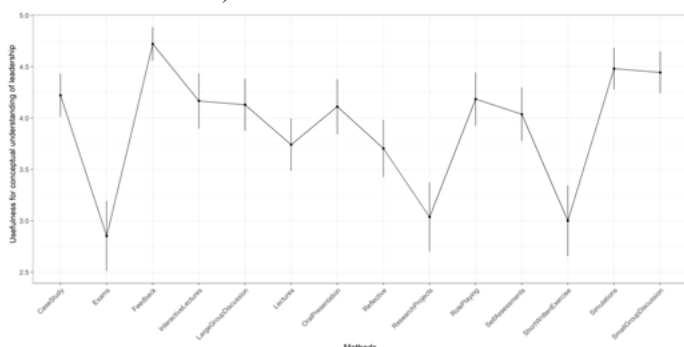
Figure 2: Average usefulness of teaching methods for the conceptual understanding of leadership (source: own research)

If we carry out a two-way analysis, it reveals that the individual methods are assessed differently with respect to their frequency of usage and influence on the conceptual understanding of leadership ($F(13.689) = 5.89$; $p < 0.001$). The next graph shows the comparison of the frequency of usage of the given methods and the usefulness of these teaching methods for the conceptual understanding of leadership. It's obvious that the higher frequency of usage of methods such as Oral Presentations ($p < 0.001$), Reflective Methods ($p < 0.001$), Research Projects ($p < 0.000$), Role-Playing ($p < 0.033$), and Simulations ($p = 0.015$) could lead to the development of the conceptual understanding of leadership (see below).
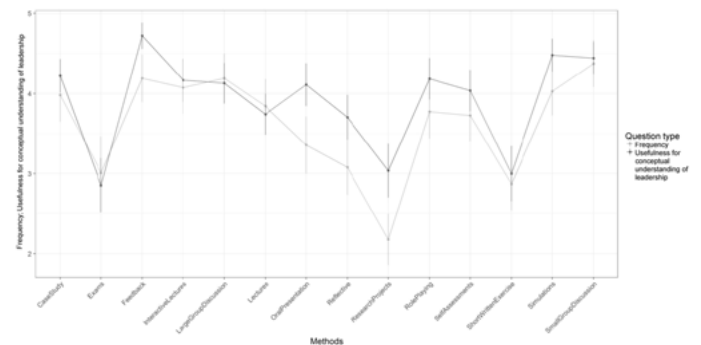
Figure 3: Comparing the frequency of usage of the methods and their usefulness for the conceptual understanding of leadership (source: own research)

The usefulness of the methods for leadership skills development

Respondents were asked to evaluate the usefulness of the teaching methods for leadership skills development. They were provided with a five-level scale (from 1 = useless to 5 = very useful). See Table 3 for the results.
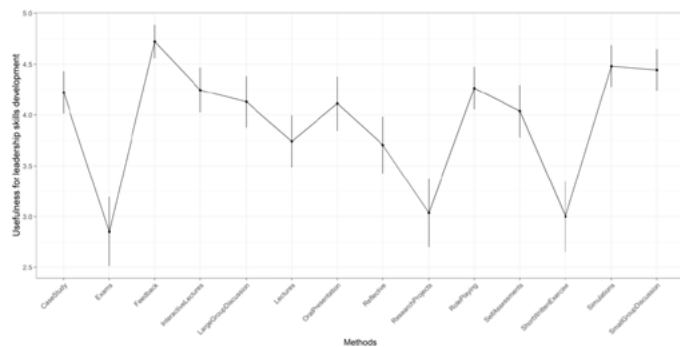
In terms of leadership skills development, the respondents of our research found feedback (4.71), simulations, model situations (4.46), and small group discussion (4.42) most useful. Research projects (3.00), short written exercise (2.94) and exams, knowledge tests (2.79) were seen as least useful for leadership skills development.

Method	Mean	SD
Feedback	4.71	0.61
Simulations, Model Situations	4.46	0.75
Small Group Discussion	4.42	0.75
Role Playing	4.27	0.77
Interactive Lectures	4.25	0.81
Case studies	4.21	0.78
Large Group Discussion	4.10	0.93
Oral Presentation	4.08	0.99
Self-Assessment Questionnaires	4.06	0.96
Lectures	3.71	0.94
Reflective methods	3.71	1.04
Research Projects	3.00	1.22
Short Written Exercise	2.94	1.24
Exams, knowledge test	2.79	1.23

**Table 3: The usefulness of the teaching methods for leadership skills development, 2015 (source: own research)**

There are significant differences among the represented methods in the assessment of usefulness for leadership skills development ($p < 0.00001$). The analysis also revealed significant differences in the assessment of the usefulness of the teaching methods for

leadership skills development ($F(13.689) = 27.85$; $p < 0.001$). Post-hoc tests showed specific differences between the individual methods (see the graph below, line segments designate the standard error mean).

Figure 4: Average usefulness of the methods for leadership skills development (source: own research)

If we carry out a two-way analysis, it reveals that the individual methods are assessed differently in terms of their frequency of usage and influence on skills development ($F(13.663) = 4.82$; $p < 0.001$). The next graph shows how the frequency of the usage of the individual methods differs from the usefulness of the methods for leadership skills development. The results indicate that increasing the frequency of the usage of certain methods (for example Feedback ($p = 0.004$), Oral Presentation ($p < 0.001$), Reflective Methods ($p = 0.002$), Research Projects ($p < 0.000$), Role-Playing ($p = 0.014$) and Simulations ($p = 0.028$) etc.) could have an influence on the perception of the usefulness of the methods for skills development.
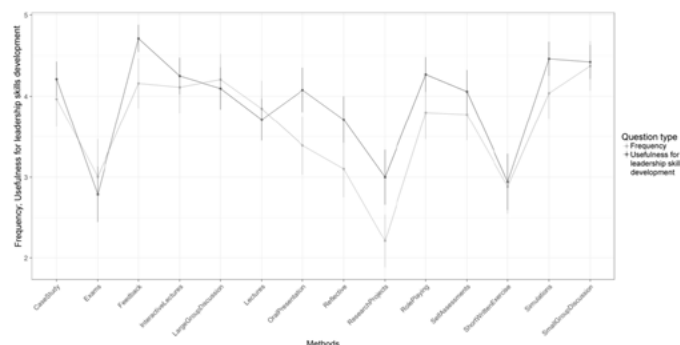
Figure 5: Comparing the frequency of the usage of the methods and their usefulness for leadership skills development (source: own research)

Knowledge level is an important basis for the further development of managers, but the focal point of the instruction is gradually shifting to the level of skills. It's not enough just to "know" or "memorize," but it's also necessary to know how to use and apply, i.e. acquire a wide spectrum of skills (social, managerial, and others). For example, the concept of versatile leadership (Pavlica, Jarošová and Kaiser, 2015) places an emphasis on managers' need to adopt various different, even contradictory, but mutually complementary skills together with versatile, wide-ranging application in practice.

The usefulness of the methods for personal growth

Respondents were asked to evaluate the usefulness of the particular methods for their personal growth. They were provided with a five-level scale (from 1 = useless to 5 = very useful). See Table 4 for the results.

The respondents have found feedback (4.81), small group discussion (4.45), simulations and model situations (4.40), and role-playing (4.34) most useful for their personal growth and

self-knowledge. In contrast, they considered lectures (3.53), short written exercise (2.96), research projects (2.94), and exams and knowledge test (2.87) to be the least useful.

| Method	Mean	SD
Feedback	4.81	0.39
Small Group Discussion	4.45	0.67
Simulations, Model Situations	4.40	0.78
Role Playing	4.34	0.92
Self-Assessment Questionnaires	4.22	0.99
Case studies	4.09	1.00
Interactive Lectures	4.04	1.02
Oral Presentation	4.04	1.02
Large Group Discussion	4.09	0.95
Reflective methods	3.81	1.19
Lectures	3.53	1.10
Short Written Exercise	2.96	1.20
Research Projects	2.94	1.17
Exams, Knowledge Test	2.87	1.23

Table 4: The usefulness of the teaching methods for personal growth, 2015 (source: own research)

The analysis also revealed significant differences in the perception of the usefulness of teaching methods for personal growth ($F(13.686) = 27.10$; $p < 0.001$). Post-hoc tests showed specific differences between the individual methods (see the graph below, line segments designate the standard error mean).
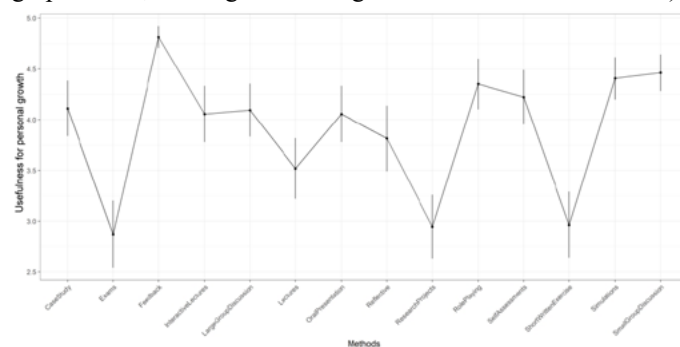
Figure 6: Average usefulness of the teaching methods for personal development (source: own research)

A two-way analysis reveals that the individual methods are assessed differently in terms of their frequency of usage and influence on personal growth ($F(13.667) = 4.98$; $p < 0.001$). The next graph shows how the frequency of the usage of the individual methods differs from the usefulness of the methods for personal growth. Especially Feedback ($p = 0.003$), Oral Presentation ($p = 0.001$), Reflective Methods ($p < 0.001$), Research Projects ($p < 0.001$), Role-Playing ($p = 0.007$) and Self-Assessments ($p < 0.019$) are among the methods that could stimulate participants' personal growth if they were used in teaching more often.
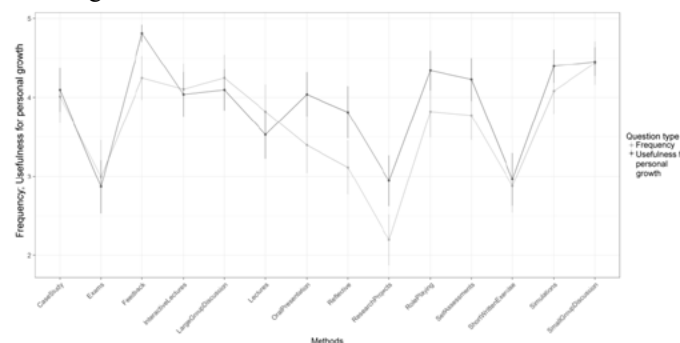
Figure 7: Comparison of the frequency of the usage of the methods and their usefulness for personal growth (source: own research)

Self-knowledge is understood as the cornerstone of leadership as well as of the further development of managerial skills. It also entails knowledge of one's own typical behaviour patterns, and also awareness of one's strengths and weaknesses (Pavlica, Jarošová and Kaiser, 2015).

One must deepen one's self-knowledge and so-called self-acceptance in order to continue one's personal development, and getting to know and understand others (Rogers, 1961 in Pavlica, Jarošová and Kaiser, 2015).

Discussion

The limitations of this study may be perceived in the fact that the respondents of the survey were MBA and lifelong learning programmes participants who all come from the same educational institution, so the results can't be seen as representative. Also, only the participants, and not the course instructors, were asked to fill in the survey. However, as the methods used in the research were based on prior research studies from abroad, it is possible to discuss the results in their context. The studies mentioned are those of Allen and Hartmann (2009) and Jenkins (2013). Both are inspired (as is our study) by Conger's primary approaches to leadership development (personal growth, conceptual understanding, skill building and feedback), which were combined with different sources of learning commonly found in leadership development activities.

In the Allen and Hartmann study, the respondents were undergraduates who were asked to share their opinion on the way in which they would like to learn about leadership. The students showed a preference for developmental activities where the primary learning objective was individual personal growth and skill building. Jenkins's study brings an overview of leadership programmes from the perspective of educators. Three hundred and three leadership instructors from the USA, teaching in-class academic credit-bearing undergraduate leadership courses, were asked to participate. The instructors showed a preference for instructional strategies that emphasise class discussion, forms of conceptual understanding, and personal growth. On the other hand, they seldom used skill-building instructional strategies or traditional assessment. These results indicate that even leadership educators, though they pay less attention to skill development, lend a significance to in-class interaction and communication in leadership development programmes and do not overestimate traditional ways of assessment, such as tests.

Since our research study was focused on analysing the methods used in specific educational programmes, we concentrated on those that were relevant to them. Therefore we chose Jenkins's overview of teaching methods (Jenkins, 2013) as the basis for our survey. The research study thus didn't strive to provide a complete summary of teaching methods and approaches that can be used in educational programmes for managers. Other methods that are appropriate for programmes that develop leadership competencies were described and analysed by quite a few authors. Inspirational examples include peer-led team learning, in which specific problem-solving workshops comprised of small groups of students led by a specially trained peer leader (Dobson, Frye and Mantena, 2013) are included in the MBA programme, or the "live-case" intervention method, which consists of a CEO bringing to the classroom a strategic issue that he/she is currently struggling with to be discussed with students in real time (Rashford and De Figueiredo, 2010). The authors cited, like others (for example De Dea Roglio and Light, 2009) emphasised the significance of teaching methods for leaders' development that enable participants to actively participate in the learning process, but also reflect their current work and experience.

Similar conclusions can also be inferred from our research study. The statistical analysis showed a significant correspondence in the differences between the frequency of the teaching methods and their perceived usefulness for various purposes (conceptual understanding of leadership, leadership skills development, and personal growth). The results reveal the respondents' increased need to present their thoughts, opinions, and experiences (individually and in a team) orally in class. Reflective methods, research projects, role-playing, and simulations are other methods that should be used much more than they have been in the programmes assessed. In the case of leadership skills development and personal growth, the greatest difference between frequency and perceived usefulness was found in the feedback provided by a teacher or other class participants. If we consider that feedback is used rather often in the programmes assessed (see Table 1), it seems apparent that the participants consider the possibility of getting feedback as the greatest stimulus for the development of leadership competencies.

Conclusion

The results of the survey have confirmed the trends in education introduced in the introduction of this article, especially the limitation of traditional "teacher-oriented" teaching, and strengthening the use of modern "learner-oriented" teaching methods. Managerial education should entail, among other things, the development of its participants' leadership competencies.

The respondents of the research – MBA and lifelong learning programmes' students at the University of Economics, Prague – have found the methods that keep them active over the course of the training and enable them to develop their understanding of leadership concepts, skill development, and personal growth through getting feedback, sharing experiences and discussion, solving various problem situations through role play and simulations or case studies to be among the most useful. The results also suggest that respondents appreciate it the most if activities that, once completed, are followed by feedback from the instructor or other participants are included. The findings are also supported by the comparison of the frequency of the usage of the given methods and their perceived usefulness. It was shown that the participants of the assessed programmes would prefer that most of the teaching methods (especially the interactive ones) would be used more often, except for lectures and exams (in the case of personal growth even interactive lectures), where the frequency of usage was higher than their perceived usefulness. In this case, it leads to reflections on the best way that the managerial education programmes impart information and knowledge or to a question whether they should use other methods of assessment (for example research projects). The results of the study have practical implications for similarly specialised educational programmes. We can recommend that instructors consider a wide range of teaching methods to meet the various purposes in leadership development while designing managerial training programmes. While they are teaching, they must bear in mind the stock that the participants place in the possibility of getting feedback for their individual inputs in the teaching process through active teaching methods. Using these teaching methods places an emphasis on creating the right atmosphere in the group to support the active participation of all education programme participants, as well as providing and accepting feedback.

The use of modern "learner-oriented" teaching methods places greater demands on the instructor, the level of his or her preparation, the ability to adapt the content and type of activities directly to the target group, and to plan time. Meeting these demands isn't easy. If managerial education programme instructors don't have the proper training in relevant pedagogical competencies, don't work on their further development, or don't get professional feedback about their teaching, their adequate usage of the teaching methods is highly unlikely.

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