

Text Mining Method in the Analysis of Peer Observation Notes of Teaching in Public Administration Study Programmes

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Abstract

Quality teaching and learning environment at the Faculty of Public Administration, the University of Ljubljana, empowers administration graduates to obtain knowledge, skills and competences needed and boosts teachers to introduce cross-curricular collaboration and innovative flexibility in their teaching. Peer observation of teaching is, according to the literature, one of the approaches in establishing pedagogical excellence and an efficient method in the professional development of higher education teachers in public administration study programmes.

In peer observation, peer teachers/observers attend each other's lectures and by making written notes, they record their observations (e.g. about strengths, weaknesses or opportunities for improvements and suggestion for teaching, their attitudes). The observation form contains comparable aspects of observation in open-ended questions, namely: (1) introduction into lectures or tutorials, (2) central part of lectures or tutorials with an emphasis on communication with students/active participation of students, teaching material, pace/dynamics, inspired teaching, what should be changed), (3) concluding activities in lectures or tutorials and (4) concluding/summarising observations of teachers in observation forms.

The aim of the investigation of peer observation sheets is to detect teachers' wording of their reflection on the observed teaching and collect the information about their common attitudes to peer observation and teaching in general. In order to establish objective research and automatically inspect the written peer observation notes and search for interconnections within, we used the computer algorithms which enable text analysis. The main problem of text analysis is a human language which computer does not understand as such. Therefore, some obvious steps must be made to prepare a written text in a form, suitable for computer analysis.

The word clouds were used to visualize and compare the wording used in observed lectures and tutorials in the three sections: pre-, in- and post- observation. The differences in the choice of language used in observations of the two study programmes were also analysed.

The findings can guide the observed and the observing teachers towards improvements in their teaching and reinforcement of interdisciplinary teaching in public administration study.

Points for Practitioners

The observed teachers recognize important elements of their own teaching practice through another teacher's perspective and receive their feedback through post-observation sessions. Such practice is an ideal intersection for teachers in the interdisciplinary study programmes to learn from each other and recognize different methods of teaching, gain new ideas and receive positive reinforcement about their own teaching practice. There is a great deal of opportunity to establish permanent collaboration among course teachers and, wider, study programmes.

Keywords: peer observation of teaching, open-ended question, higher education, public administration, text mining

1 Introduction

The European area of higher education (HE) has been setting standards for improving the quality of teaching and learning. In their recommendations, the European Commission (2013) promotes the idea that such activities do not require big amounts of financial resources but rather a change of approaches to teaching and learning. Academic staff is urged to employ teaching and learning activities underpinning clear and agreed learning outcomes, developed in partnership by all faculty members involved in their delivery. Therefore, HE institutions

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should introduce and promote cross-, trans- and inter- disciplinary approaches to teaching, learning and assessment. Such approaches aim to empower teachers in their work and students in the acquisition of knowledge, skills and desired competences, which contributes to the development of the institution and the area of public administration study.

The Faculty of Administration (FPA), the University of Ljubljana with the enrolment of around 1000 students delivers three cycle study programmes: first cycle study programmes (Public Sector Governance (PSG), Administrative Information Science and the higher education professional study in Administration), second cycle programmes (Administration - Public Sector Governance and Management in Administration) and the recently accredited joint doctoral study programme Governance and Economics in the Public Sector. The FPA study programmes' design and their delivery have been focused on interdisciplinarity, which requires abundant opportunity for teacher cooperation and exchange of good teaching practices. The FPA set out its priorities in the Faculty Strategy 2014-2020 and improvements in the quality of teaching and learning are among them. The FPA Centre for the Development of Pedagogical Excellence (CDPE), among other things, provides support to the continuing collaborative professional development in the form of workshops, where a relatively small faculty teaching staff builds a tightly-knit teaching community by enhancing their professional development. The results are several attempts in team teaching (two teachers simultaneously conducting a lecture or seminar), inter-courses student activities (student assignments are set and assessed as a combination of two courses' requirements) and peer-observation of teaching (POT) sessions. Such practices have established a feeling of mutual trust and confidence among the staff and have led to permanent teacher partnerships. In the last two years such good practices have been recognised as elements of quality teaching. Based on the decision the FPA Senate, POT has been included in the FPA reward structures as a good teaching practice. Since 2017 the interest in POT among FPA teachers has increased.

1.1 Peer observation of teaching

POT is an efficient method in the professional development of HE teachers and is the observation of teaching practice in any format of delivery (in classroom or as e-learning). It is done by teachers whose aim is to improve their teaching practice and learn about it by observing others teachers, mostly their colleagues on a reciprocal basis. Pairs involved in POT may be mentor and novice or experienced teacher with experienced teacher. The focus of observation can be either helping the young teacher to develop their teaching skills both by observing and being observed by their experienced colleague or an opportunity for teachers to reflect on their colleague's teaching or their own in a relaxed atmosphere of mutual agreement and trust.

POT can be conducted as an agreement between peer teachers or as a formal system of monitoring teacher performance (Bell, 2002), it can be a powerful learning and training process for individual lecturers or the whole department (Gosling, 2002) and a great potential for teachers to promote self-knowledge and personal growth process in which student feedback needs to be addressed as well (Shortland, 2004). POT needs to be carried out in a positive climate of dialogue and open debate about good teaching and learning (Donnelly, 2007) and with a feeling of mutual trust and respect between the colleagues (Cosh, 1998). Teachers experience different ideas and methods in various situations of their own teaching by taking risks in implementing them. They can reflect critically on them through their colleagues' feedback after observation. POT is in fact learning by observing and can be a source of new ideas for one's own classes and positive reinforcement about their own teaching methods (Harris, Farrell, Bell, Devlin, & James, 2008).

The observed teachers express their positive attitude regarding POT and believe that the advantages of observation outweigh the disadvantages (Lasagabaster & Sierra, 2011). Some teachers will be unwilling to take part in POT, due to unease and anxiety or the feeling of being assessed. Only teachers acquainted with the POT protocol, the time, the purpose, the goals and the form of feedback will be empowered by the feeling of command and self-control. Some authors (Martin & Double, 1998) see the advantages of POT in the enhancement of collaboration between teachers, in building their professional and interpersonal skills through giving feedback on the areas of expertise and in possible improvements in teaching.

The main goal of the present study is to investigate the written POT accounts of the observed and the observing teachers in order to detect the wording of their reflections recorded prior to, during and after observations. The text mining method was used to examine the collection of information: about the points of interest in POT, the language used to describe intentions and expectations in POT. The findings shown in word clouds can also reveal some differences in the observation notes of lectures and tutorials and the perceptions of the two study programmes' observation experience. An examination into how teachers reflect on possible improvements in

teaching and reinforcement of interdisciplinary teaching in public administration study programmes is also part of this study.

2 Data and Methodology

The peer observation in this research was conducted at the Faculty of Administration (FPA) in two first cycle study programmes. Prior to the present study, two studies have been conducted at the FPA regarding POT. A pilot project on POT at the FPA in 2014-15 (Danko, Keržič, & Kotnik, 2016) devised their own model for observation and compared the teachers and students-volunteers' perceptions about teaching through peer observation. The observed strengths, weaknesses or opportunities for improvements in teaching were investigated. The text mining and visualization tools for analysing peer observation notes was applied in the study of whether student-observers in POT can be considered a relevant source of information on strengths, weaknesses or opportunities for improvements in teaching (Danko & Keržič, 2018).

Therefore, in the academic year 2017/18, there were 18 observations done by 14 teachers (out of 34 teaching staff at the FPA) who (in most cases) made reciprocal observations. POT was made in 10 lectures and 8 tutorials of small groups (Table 1).

Table 1: Number of observations (POT sheets).

	Administration study programme	Public Sector Governance (PSG) study programme	Total
Lectures	2	8	10
Tutorials	4	4	8
Total	6	12	18

The POT accompanying observation sheet, adopted at the FPA, was designed taking into account a peer review model (Gosling, 2002) which is used for the development of flexibility and innovation in approaches to teaching and learning. The FPA devised their own a three-session POT model in Slovene (Danko et al., 2016):

1. Pre-observation: a meeting of the observed and the observing teacher is essential for the establishment of rapport between partners (presentation of lectured topic, expected learning outcomes, familiarisation with the content);
2. In-observation: a teaching activity (lecture, tutorial) is observed, it is described not evaluated or assessed (notes made during observation about teaching (methods, delivery) students' and teacher's work, establishing rapport, checking understanding, managing students' activities, elements of motivation, etc.);
3. Post-observation meeting: a non-judgemental reflection on teaching in the atmosphere of equality and reciprocity (friendly recognition of good teaching that raises the confidence and trust) is done.

For the purpose of the present study, a selection of observation items was made (Table 2) as the study was interested in the language/wording (words, combination of words, expressions) the observing teachers used in describing their points of interest. Only items that require meaningful descriptive answers in open-ended answers and descriptions were selected. They reveal teachers' opinions and perceptions, knowledge and to some extent even feelings about their observation experience.

Table 2: A selection of observation items

Pre-observation	
<i>Observing teacher</i>	<i>Observed teacher states:</i>
(chooses) three elements to be observed	
(states) main goal of observation	main goal of observation
In-observation	
<i>Observing teacher observes:</i>	
Teaching method	
Activation of students	
Post-observation	
<i>Observing teacher gives feedback to observed teacher on:</i>	
Overwhelming experience	
Outstanding elements of teaching	

To process the selection of observation items a text mining technique was used. Nowadays, the automated processing of text (Allafyari et al., 2017; Agrawal & Batra, 2013; Schonlau & Guenther, 2016) has become an important field of analysing text data sets. When a large amount of text data is generated in, e.g. a web environment (forums, blogs, social networks, twitters...) or research, automatic and objective data analysis is desired. With text mining technique a natural text is converted into numerical variables, so we could then investigate them with statistical methods (Schonlau & Guenther, 2016). Text mining is also useful in open-ended questions in surveys (Agrawal & Batra, 2013; Baek, Cappella, & Bindman, 2011; Reich, et al., 2014).

The observation sheet mainly consists of open-ended questions, which require written answers. For the text data computer processing, the answers had to be retyped into the data file. As open-ended answers do not restrict the respondent to use particular words, different wordings with the same meaning are used. Only a human being can recognize such wordings, therefore, in the retyping process certain words were unified with appropriate synonyms, e.g. words “professor”, “lecturer”, and “assistant” were replaced by “teacher”. In addition, the unification of verb tense, grammatical number and stemming were made and the recorded text was translated into English. Therefore, lemmatization has not been processed as retyping was done in compliance with lemmatization rules. Each text document (POT sheet) represented one record in the data file or corpus.

Open source program Orange (Demšar et al., 2013) was used for the text analysis. In the first pre-processing steps upper cases were converted to lower cases, tokenization was based on punctuation and words, then stop-words were removed from the corpus. The set of stop-words consisted of prepositions (e.g. “in”, “on”...) and conjunctions (e.g. “and”, “or”...).

An n-grams, the most widespread approach to text mining (Schonlau & Guenther, 2016), is a contiguous sequence of n-words (terms) appearing in the text. In a written text, words are separated with white space. But there are also multi word phrases, which can not be treated separately, therefore we can take into account sequences of n-words and not only separate words. During processing n-grams, the text document is represented with the number of occurrence of the terms (n-grams) in it without taking into account the order of the words or grammar. A word cloud visualizes a relative frequency of terms. The higher the frequency of terms is the larger the font is. A word cloud is frequently used as a starting method in a text analysis and its simple visualization has a great potential (Heimerl et al., 2014). Therefore, word cloud enables an intuitive visual overview of corpus and helps to decide on further methods exploring it.

Since the present survey investigated the frequently used words in POT sheets, a visualization with a word cloud was most useful. During the first examination of our corpus we only used unigrams (1-grams) but the results were not promising. Since observation reports used multiword sequences (phrases), we decided to perform further analysis with 2- and 3-grams.

3 Results

The analysis of our corpus resulted in word clouds which visualize frequencies of terms used in the selected items of observation (Table 2). Word clouds enable us to interpret and compare the wording used in observing

methods the observed teachers would employ. The evidence could lead to the conclusion that teachers are ready to learn by observation in order to improve their practice or seek common content to be able to establish further partnerships.

A variety of different aspects of observation activities were expressed by the observed teachers. Not only did they want to receive feedback on the *communication* between themselves and the students and their ability to *activate* them but they also sought information on the *coherence* of the *delivery* of content, the *speech* and the *use of language*. The urge to observed teachers to provide information on the *opportunities for improvements* was one of the most wanted.

Figure 2 shows the difference in wording of the observed teachers regarding lectures and tutorials. The results point out that the interest of what can be observed in tutorials lies in *communication* and *language* teacher used with students and what *opportunities for improvements* could be. The lecture observations' results show that *coherence in delivering content, activation and encouragement of students* present the main points of the teachers' interest.

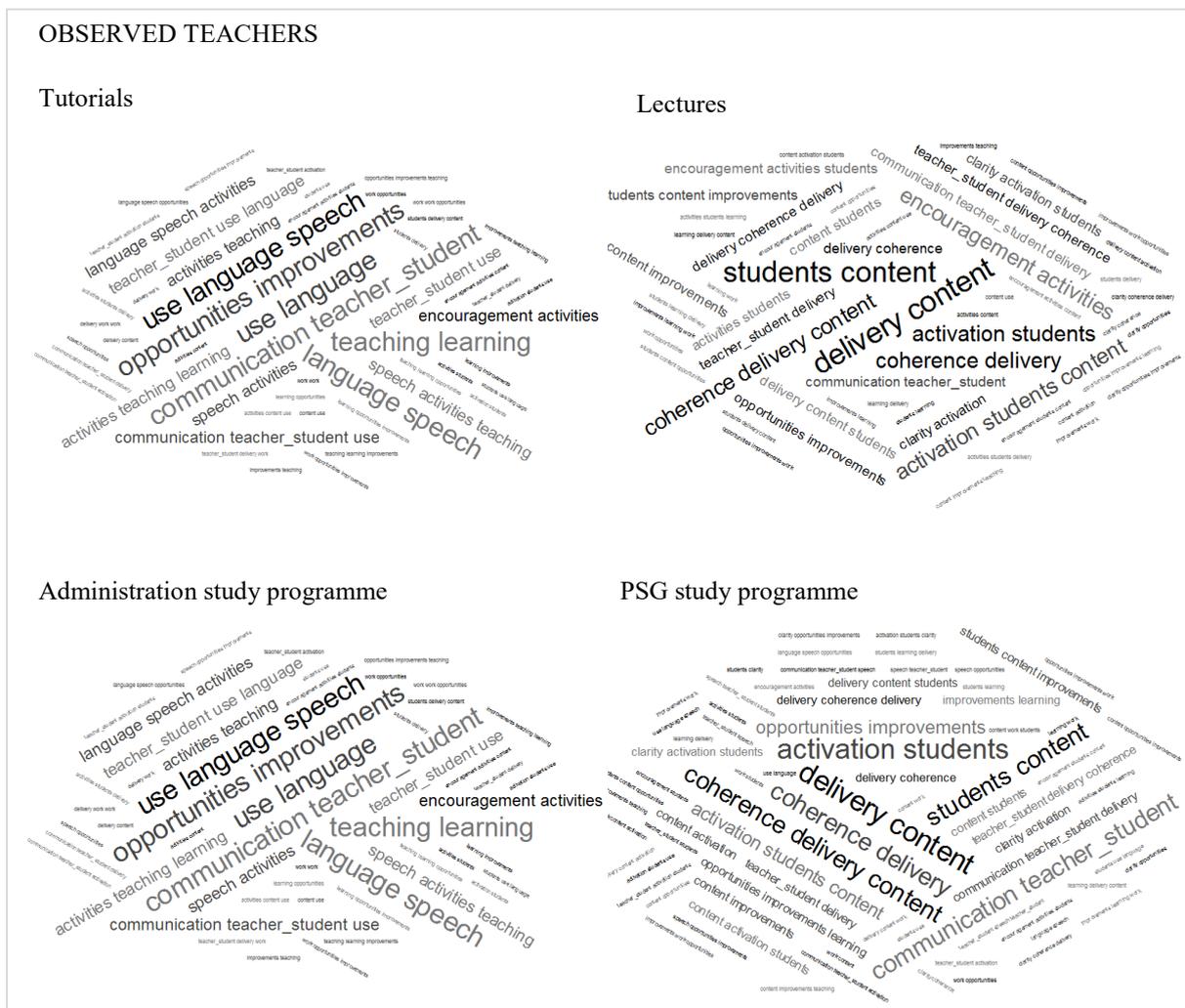


Figure 2: Word clouds - Pre-observation: lectures and tutorials, Administration and PSG study programmes

The results of the survey show that the most common elements of the observation in Administration study programme were *language, communication with students and opportunities for improvement*. The PSG study observation teachers were interested in *coherence and delivery of content and student activation*.

3.2 In-observation

For the purpose of this research two items from the in-observation list were selected: teaching method and activation of students. They were selected based on the fact that low student motivation is an issue that has been

questions to students. It suggests that students are actively involved in lectures and plenty of real life examples are provided for motivation and engagement.

Some differences can be observed in the methods used in either Administration programme or PSG. Administration study teachers use *examples* and *cases* (connecting real world to lecture room) and *work with study material* is more often reported in comparison to PSG study. In this study *individual work* of students and *brainstorming* seem more often as methods of student activation.

3.3 Post-observation

Elements that were outstanding in the observers' perception and things that overwhelmed them were discussed in post-observation meetings. The FPA model of observation directs teachers to carry out the session in a positive climate of dialogue and open debate about good teaching and learning, therefore they are advised to concentrate on positive aspects only.

The most commonly used wording in post-observation meetings' notes are *communication with students*, *students examples*, *explanation*, *activation*, *cross-curricular connection*, *students name*, *explanation*, *content*, *solving cases* and *tasks*, *attitude*, *students* and *encouragement* (Figure 4). This suggests that teaching has been discussed as an active process which puts students' activities in the centre of teachers' attention.



Figure 4: Word clouds – Post-observation (positive aspects of teaching)

A more detailed insight into the wording of the two programmes (in separate word clouds) does not show essential differences in the most commonly used words. In the Administration study word cloud *students communication*, *cross curricular connection* and *students solving cases* are more obvious. In the PSG post-observation discussion *encouragement of students*, *attitude to students* and *students name* appear to be more relevant, which could lead to the conclusion that elements of a good rapport between teachers and students in PSG has been observed and noted down.

4 Conclusion

The current literature has identified the need that teachers reflect on their own teaching practice through the eyes of their colleagues and exchange observations in a friendly manner without being exposed to evaluation. Therefore, the main purpose of this study was to process the written POT notes of 18 sessions with 14 teachers (out of 34 teaching staff) at the FPA in order to find the most used words, phrases and expressions the observing and the observed teachers used in their written reflections on teaching. Although it has been a small-scale research, it has to be noted that POT is still in its developing phase at the FPA and the findings can not be generalised.

The text mining method has been used and the results of analysis are shown in word clouds. The analysed notes reveal some differences in the observation notes of lectures and tutorials and the teachers' perceptions regarding the two study programmes.

This study confirmed that the idea of reciprocal observation can help promote the establishment of teacher partnerships for further cooperation and inter-course activities. Thus can result in strengthening the interdisciplinarity of public administration programmes. The results of text mining shown in word clouds report sets of expressions teachers used in describing their reflections in post-observation meetings. They prove that teachers really concentrated on the positive aspects of teaching and in most cases highlighted the elements that are common to all teaching staff (involvement of students, language used, student activation and motivation for work and recognition of good teaching practices). The results provide the evidence into what matters to them and that POT can be a source of inspiration how to improve teaching, cope with students' inactivity or lack of motivation.

A comparison between the two programmes suggests that PSG students' performance is challenged by individual work and brainstorming and the Administration students are guided towards the goals of teaching by examples and cases. This could be ascribed to the fact that Administration students have always shown the tendency to be guided with more support and plenty of motivating elements and PSG students have always been more independent learners. The inclusion of students into teaching, observed in both programmes, shows the tendency to empower them for self-directedness in learning. Such trend could underpin the FPA efforts in the implementation of formative assessment (monitoring student learning by immediate feedback and improve their learning) rather than summative (evaluate student learning at the end of course) and therefore provide more space for student engagement.

Our findings have proven that HE teachers show a great deal of interest to observe and be observed and have given POT a serious consideration in their discussion. The results obtained show that POT at the FPA could be devised further in developing a more systematic approach to making it a powerful learning experience of the teaching staff and a source of establishing pedagogical excellence in HE.

5 References

- Agrawal, R. & Batra, M. (2013). A detailed study on text mining techniques. *International Journal of Soft Computing and Engineering*, 2(6), 118–121.
- Allafyari, M., Pouriyeh, S., Assefi, M., Safaei, S., Trippe, E. D., Gutierrez, J. B., & Kochuut, K. (2017). A brief survey of text mining: Classification, clustering and extraction techniques. KDD Bidgas, Halifax, Canada. Retrieved from <https://arxiv.org/abs/1707.02919>
- Back, Y. M., Cappella, J. N., & Bindman, A. (2011). Automating content analysis of open-ended responses: Wordscores and affective intonation. *Communication Methods and Measures*, 5(4), 275–296, doi: 10.1080/19312458.2011.624489

- Bell, M. (2002). Peer observation of teaching in Australia. LTSN Generic Centre. Retrieved from <http://www.ltsn.ac.uk/genericcentre>
- Cosh, J. (1998). Peer observation in higher education – A reflective approach. *Innovations in Education & Training International*, 35(2), 171–176.
- Danko, M. & Keržič, D. (2018). Application of text mining and visualization tools for analysing peer observation notes. INTED2018 Proceedings (pp. 4539–4546). IATED.
- Danko, M., Keržič, D., & Kotnik, Ž. (2016). Peer observation in higher education as an agent of change in teaching and learning. INTED2016 Proceedings (pp. 7600–7610). IATED.
- Demšar, J., Curk, T., Erjavec, A., Gorup, Č., Hočevar, T., Milutinovič, M., et al. (2013). Orange: Data mining toolbox in Python. *Journal of Machine Learning Research*, 4 (Aug), 2349–2353.
- Donnelly, R. (2007). Perceived impact of peer observation of teaching in higher education. *International Journal of Teaching and Learning in Higher Education*, 19(2), 117–129.
- European Commission. (2013). Modernisation of higher education. Report to the European Commission on improving the quality of teaching and learning in Europe's higher education institutions. Luxembourg: Publications Office of the European Union. doi:10.2766/42468
- Gosling, D. (2002). Models of peer observation teaching. LTSN Generic Centre. Retrieved from https://www.researchgate.net/publication/267687499_Models_of_Peer_Observation_of_Teaching
- Harris, K.-L., Farrell, K., Bell, M., Devlin, M., & James, R. (2008). Peer review of teaching in Australian higher education: A handbook to support institutions in developing and embedding effective policies and practices. CEDIR, University of Wollongong, [E-Reader Version]. Retrieved from http://www.cshe.unimelb.edu.au/research/teaching/docs/PeerReviewHandbook_eVersion.pdf
- Heimerl, F., Lohmann, S., Lange, S., & Ertl, T. (2014). Word cloud explorer: Text Analytics based on word clouds. In R. H. Sprague (Ed.), *Proceedings of the 47th Hawaii International Conference on System Science (HICSS) 2014* (pp. 1833-1842). doi: 10.1109/HICSS.2014.231
- Lasagabaster, D. & Sierra, J. M. (2011). Classroom observation: Desirable conditions established by teachers. *European Journal of Teacher Education*, 34(4), 449–463.
- Martin, G. A. & Double, J. M. (1998). Developing higher education teaching skills through peer observation and collaborative reflection. *Innovations. Education & Training International*, 35(2), 161–170. doi: 10.1080/1355800980350210
- Reich, J., Tingley, D. H., Leder-Luis, J., Roberts, M., & Stewart, B. (2014). Computer-assisted reading and discovery for student generated text in massive open online courses. *HarvardX Working Paper*, 6. SSRN. doi: 10.2139/ssrn.2499725
- Schonlau, M. & Guenther, N. (2016). Text mining using n-grams. doi: 10.2139/ssrn.2759033
- Shortland, S. (2004). Peer observation: A tool for staff development or compliance? *Journal of Further and Higher Education*, 28(2), 219–228. doi: 10.1080/0309877042000206778