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How is Teachers' Feedback-Seeking Frequency Related to Their Performance Scores while Using Learning Analytics-Enhanced E-portfolio?

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Abstract: This study sets out to address the contradictory findings in previous research about the relation between feedback-seeking behaviour and performance. The log files of 40 in-service teachers who used an electronic portfolio with learning analytics were analysed to identify how the teachers used the learning analytics applications, and to explore the relationships between the feedback-seeking frequency, use of learning analytics applications and performance scores. This study demonstrates sparse use of learning analytics applications and offers possible explanations for this finding. In addition, the study showed a negative relation between the score of evaluating students and feedback-seeking frequency. These findings and other considerations for additional research using feedback-seeking behaviour, performance scores and learning analytics are addressed.

Keywords: Log files, Learning Analytics, Feedback Seeking Frequency, In-service Teachers

Interest in the feedback area has been primarily sustained because of its performance-improving effect. Feedback has been defined as information that is provided by an agent (teacher, peer, or even a software program) regarding aspects of his performance or understanding (Hattie & Timperley, 2007). It is considered to have the most powerful effect on one's performance and achievement but, according to Hattie and Timperley (Ibid), Kluger & DeNisi (1996), Morrison (1993), this impact can be either positive or negative. In order to be effective and support the person's sense of competency, feedback needs to be clear, purposeful, meaningful, and to provide logical connections. However, insufficient performance-related feedback may sometimes lead to people's reluctance to accept feedback, especially if it is negative or destructive (Tuckey, Brewer, & Williamson, 2002). Therefore, active feedback seeking can be considered a valuable mechanism to obtain useful information about one's performance (Levy, Albright, Cawley, & Williams, 1995). Feedback seeking, being closely connected with person's self-evaluation and self-assessment is also an important tool for developing effective self-regulation skills (Anseel, Beatty, Shen, Lievens, & Sackett, 2015) and autonomy.

In 1983, Ashford and Cummings proposed a theoretical model of feedback-seeking behaviour where they showed its conscious devotion of effort determining the correctness and adequacy of behaviours to achieve set goals. Although feedback allows people to make corrections in their performance over time (Anseel et al., 2015), literature offers contradictory findings about the relation between feedback-seeking behaviour and performance. In their meta-analytic review of the antecedents and outcomes of feedback-seeking behaviour, Anseel and colleagues (2015) showed the positive, however, small mean correlations between feedback-seeking behaviour and job performance.

Compared to many other countries participating in the TALIS research (2013), Estonian teachers report getting more feedback about their job than other teachers. However, the amount of

positive consequences (e.g. self-confidence as a teacher, public recognition, growing motivation and job satisfaction) expected to follow the feedback is reported lower in Estonia than on the average in TALIS study. Therefore, teachers may feel that the feedback and assessment systems are merely formal and do not influence their work in the classroom substantially (Ibid). TALIS research provides information about how the system gives feedback to teachers, but it does not indicate how willing teachers are to seek and receive feedback, and whether their motivation to get feedback is somehow related to their performance.

Recent developments in the field of learning analytics could help address this problem. Learning analytics as "the measurement, collection, analysis, and reporting of data about learners and their contexts, for the purposes of understanding and optimising learning and the environments in which it occurs" (Siemens, 2013, p. 1382) is perceived as an effective and efficient way to provide immediate feedback (Johnson et al., 2013) in the workplace and therefore enhance performance.

This paper addresses the contradictory findings of earlier studies by exploring teachers' feedback-seeking behaviour and its relations to their performance using the affordances of learning analytics (LA). The aim of the current study is twofold: 1) to identify how teachers used the LA applications in the electronic portfolio (e-portfolio) to receive feedback to their professional activities, 2) to explore the relationships between the feedback-seeking frequency, use of LA applications and performance scores.

1. Theoretical Framework

The need for obtaining feedback about one's performance is considered a basic human need (Anseel et al, 2015). Feedback-seeking behaviour (FSB) is a proactive activity initiated by an individual to get information about his or her performance. According to Crommelinck and Anseel (2013) FSB is "the conscious devotion of effort towards determining the correctness and adequacy of the behaviour for attaining valued goals" (Ibid). It is considered a valuable resource for the individual as it facilitates his adaptation, learning and performance. In order to better comprehend an individual's FSB and support its efficiency, it is necessary to know the related antecedents and outcomes.

FSB has been claimed to benefit in three main areas: performance, learning and creativity, and adaptation and socialisation (Crommelinck & Anseel, 2013). As the focus of the current study is on job performance, this area is observed most thoroughly. The importance of FSB while improving the job performance, and increasing one's efficiency has been shown in many studies (e.g De Stobbeleir, Ashford & Buyens, 2011). In addition, FSB has been reported to reduce uncertainty, lead to more positive attitudes (Hays & Williams, 2011), and increase job satisfaction (Anseel et al, 2015).

Job performance is the construct that can be considered an antecedent as well as outcome. Though FSB may lead to improved job performance, the poor job performance may increase the individual's willingness to seek feedback more frequently. Hence, these two are bilaterally related. The same logic applies also for other constructs. According to Anseel and his colleagues' example (2015), the inconclusive results for uncertainty and role ambiguity might result from the fact that uncertainty as an antecedent leads to increased feedback seeking, which in turn leads to a strong decrease in uncertainty as an outcome.

Ashford and Cummings (1983) have distinguished two ways of feedback seeking methods – inquiry and monitoring. Inquiry method can be considered the direct one, while the person is directly inquiring about his or her performance. Whilst, in the case of monitoring, the person is observing the situation where feedback is seeked and given to other people. In the case of the current research, the teachers' activities in the teaching process were monitored, but teachers could decide themselves whether and how frequently they inquired for feedback given about these teaching situations. This specification leads us to the second important aspect of FSB – frequency of seeking feedback.

A consideration of feedback as an individual resource suggests several motivators of FSB. Most fundamentally, in situations in which feedback has more value as a resource, individuals should be more motivated to seek it. However, it appears that the motivation to seek feedback is not entirely straightforward. The theoretical model by Ashford and Cummings (1983) proposed that individuals seek feedback to reduce uncertainty about what goals to pursue and the behaviours required to

achieve those goals. Though in many situations it may be very useful to obtain feedback for its error corrective and uncertainty reducing properties, individuals may be reluctant to actively pursue it in an attempt to protect their self-esteem. Indeed, it is perhaps the poor performers, who need feedback most for its utilitarian value, or who will be most reluctant to seek it because of potential ego damage. In any situation, these various motives may be more or less operative depending on various contextual factors such as the nature of the technology, the amount of feedback provided, the seeker's past experiences, and his expectations for future performance. It is the level of these motivations, in combination, which determine the individual's level of active feedback seeking (Ashford & Cummings, 1983).

E-learning environments and learning management systems store data about learners' activities in log files. They are able to record huge amounts of data about learners' actions within different learning situations, their interactions and feedback-seeking behaviour. Log files enable to track their actions at a great level of detail. Learning analytics gives meaning to these data and provides valuable information about the learning activities and performance. According to Cocea and Weibelzahl (2006), log files analysis is used on various purposes. It enables to provide information to tutors to facilitate and give more accurate feedback to learners, to monitor group activities, to identify benefits and solve difficulties related to log data analysis, to use response times to model student disengagement, to infer attitudes about the system used, and to infer attitudes that affect learning, to name some of them. Activity tracking is also considered as a source of information for assessing users' feedback-seeking behaviour.

Log files provide teachers and course administrators with activity reports that can be filtered by different variables depending on the purpose. This enables automatic prediction of learners' performance (Ibid). Several researchers have found positive significant relations between the frequency and time learners spend in the e-learning environment and their academic progress (Damianov, 2009; Vengroff & Bourbeau, 2006). It has also been shown that high achieving students spend relatively more time in the learning management systems compared to their low achieving companions (Dawson, McWilliam & Tan, 2008).

However, most of these studies basically focus on students. Similar studies are difficult to find about in-service teachers or other employees participating in follow-up schooling or in-service training. Therefore, the current research is trying to fill the gap and investigate the relations between the actual use of the system and performance, to be more precise, use of the learning analytics applications, feedback-seeking behaviour, and performance in the case of in-service teachers.

2. Method

The pedagogical basis of the e-portfolio lies in an assessment rubric which was designed as a preliminary step before the e-portfolio implementation (see further Leijen et al., 2017). The rubric comprises five professional roles, which are divided into 12 professional activities which, in turn, are subdivided into 25 performance indicators. For this study, only the first professional role "Designer, supervisor and evaluator of learning activities (subject knowledge and supervisor of the learning process)" was used, as this role was seen as the most important role in teaching. This role consisted of five professional activities, e.g. setting learning goals for the lessons, choosing or designing appropriate learning materials and methods, planning the execution of learning activities, carrying out the learning activities, evaluating the pupils' accomplishment of the learning goals and giving them feedback. For each professional activity there were five performance levels.

In this study, the existing web-based e-portfolio EPASS (http://my.epass.eu) was used. The e-portfolio included two LA applications – the just-in-time (JIT) feedback module and the visualisation (VIZ) module. The JIT module provided the users 1) automated feedback which was the pre-formulated feedback messages based on an assessment rubric, and 2) supervisor feedback, which in the context of this study were the written comments provided by the colleagues. The VIZ module presented the teachers informative graphical representations of the scores of their professional activities. Teachers could choose between different visualisations e.g. line graph, bar chart or spider diagram, or table to see their progress. Detailed description of the LA applications is presented in the article by van der Schaaf and colleagues (2017).

The sample consisted of 40 in-service teachers who used the e-portfolio with learning analytics applications during a university course on lesson observation and analysis over a period of

one month in the autumn of 2016. Background information about the teachers was gathered at the end of the course (N = 34). The teachers' age varied from 25 years to 67 years and the mean age was 42.9 (N = 33; SD = 10.7), all were female. Approximately half of the participants (N = 18, 52.9%) reported prior use of e-learning systems, however a little less than a quarter of the participants (N = 8, 23.5%) had used an e-portfolio before. Additionally, teachers' specialty varied across three areas, i.e. pre-school teacher (N = 21, 61.8%), subject teacher (N = 11, 27.5%), and primary school teacher (N = 2, 5.9%).

Teachers were asked to carry out professional activities at their workplace and invite a colleague to observe, assess (on a 5-point performance level scale) and write feedback on their activities via the e-portfolio. This information was the bases for the input in the JIT feedback and VIZ modules. Since prior research has shown that the implementation of e-portfolio can be a complex process (Granberg, 2010), extra attention was paid to training of the teachers on the use of the e-portfolio system. Manuals and videos of how to use the e-portfolio system were provided and the teachers could at any time contact the researchers via e-mail. After logging in the system, the teachers gave their permission to use their log file data for research.

Log files from the e-portfolio environment were used to gain insight into teachers' actual use of the LA applications. Although data about the clicks and time spent on different features of the LA applications were logged, only the clicks in the system are used in this study since the time spent in the system did not give reliable findings.

Feedback seeking frequency was operationalised as the number of times the teacher asked for additional feedback in the e-portfolio system for professional activities after receiving his/her first score (0 – received feedback once, did not ask for further feedback, 1 – asked for feedback twice, 2 – asked for feedback three times).

The mean scores of the five professional activities were calculated. Then, the Shapiro-Wilk test was used for testing the normality of the five performance scores in data distribution. Spearman's correlation was used to analyse the relationships between the feedback-seeking frequency, use of LA applications and performance scores.

3. Results

The first aim of this study was to identify how teachers used the LA applications in the e-portfolio to receive feedback to their professional activities. Results showed, that the use of the LA applications was rather sparse. Although most of the teachers (N = 35) clicked on either the JIT feedback or the VIZ module, the latter was more popular among the teachers. However, the specific use of the different features in the VIZ module was dissimilar. Line graph was viewed most often (N of clicks was 276), whereas only 32 clicks were done on the general table (13 teachers made use of it). Nonetheless, Spearman's correlation showed highly significant correlations ($p < .01$) between the use of the different features in the VIZ module. This indicates that the teachers who were interested in one of the features in the VIZ module were more likely to click on some other feature in the VIZ module.

The JIT module was used very rarely. Only four teachers clicked on the automated feedback and the overall number of clicks on this feature was nine. A little more clicks were done on the written feedback feature (N = 25), however, the number of teachers who used this feature was also small (N = 9). Spearman's correlation showed moderate significant correlations ($r_s = .469$, $p < 0.01$) between the use of the automated feedback and the written feedback. This finding shows, similarly to the finding about the use of the VIZ module, that the teaches who clicked on one feature in the JIT module were more likely to click on the other one as well.

The second aim of this study was to explore the relationships between the feedback-seeking frequency, use of LA applications and performance scores. There was a weak positive correlation between the feedback seeking frequency and the clicks done on the line graph in the VIZ module, which was statistically significant, $r_s = .348$, $p < .05$. However, the correlations were non-significant between the feedback seeking frequency and the other LA applications with their features.

The mean scores of the professional activities were similarly high, ranging from 3.6 to 3.8 on a 4-point scale. Concerning the feedback-seeking frequency, the professional activity about the evaluation was assessed most infrequently (N = 30). There was a weak negative correlation between this activity and the feedback-seeking frequency, $r_s = -.428$, $p < .05$. This means that the teachers

who received low scores for this activity were more likely to ask for more feedback on this activity and the other way around. The relationships between feedback-seeking frequency and all the other professional activity scores were not significant.

4. Discussion

This study set out to investigate how in-service teachers used LA applications in an e-portfolio to receive feedback to their professional activities, and the relationships between the feedback-seeking frequency, use of LA applications and performance scores.

In order to see how the teachers used the LA applications, log files from the e-portfolio were analysed. Although several studies have indicated significant positive relations between the time learners spend in the e-learning environment and their academic progress (Damianov, 2009; Vengroff & Bourbeau, 2006), the time spent in the system did not give reliable findings in this study. Therefore, only the clicks made on the LA applications were used. The analysis of the clicks showed that although the use of the LA applications was rather sparse, the teachers preferred visualisation module over just-in-time feedback module. Even though the teachers had different graphical solutions in the visualisation module, they clearly preferred to see their development presented to them in the form of a line graph rather than bar chart, the spider diagram, or the table. Moreover, there was a weak positive correlation between the feedback-seeking frequency and the clicks done on the line graph feature in the VIZ module. This suggests that the participants in this study preferred the easiest and most familiar visualisation.

It was somewhat surprising that the number of clicks on the JIT feedback module was very low. The low number of clicks on the written feedback can be explained with the fact that teachers had received feedback from their colleagues already orally after the lessons and did not see the necessity to read it again in the e-portfolio. Even lower use of the automated feedback implies that the teachers did not see the extra value that the automated feedback could provide. Further research should be undertaken to explore in-depth teachers' perceptions of the usefulness of the JIT feedback module.

This study set out to address the contradictory findings of earlier studies about teachers' feedback-seeking behaviour and its relations to their performance using the affordances of LA. The results showed a weak negative correlation between the activity about evaluating pupils' accomplishment of the learning goals and giving them feedback, and the feedback-seeking frequency. This outcome is contrary to the outcomes of the meta-analytic review of Anseel et al. (2015) who found a positive, however, small mean correlations between feedback-seeking behaviour and job performance. There are several possible explanations for the negative correlation in this study. Firstly, the teachers who received high score for their performance in this professional activity, did not request additional feedback. This result may be due to the ceiling effect, where teachers felt that they had no possibility to improve. Another possible explanation for this negative correlation is that the teachers who received lower scores, requested more feedback on their performance. This may be explained by their uncertainty in this activity, a result which has been also shown by Anseel et al. (2015).

The current research was focusing on feedback seeking frequency. Even though frequency is considered an important and informative characteristic of FSB, it is not sufficient to rely on this characteristic alone. Crommelinck and Anseel (2013) indicate that awareness of how often feedback was asked for should be complemented by other aspects, like timing or the person who feedback was seeked from. In the current study, teachers had the possibility to choose the colleagues that observed their lessons and gave feedback. It may be that the colleagues had a favourable relationship with the teachers and therefore this could also explain the high performance scores. The person who is targeted is a strategical decision as this enables to affect the obtainable feedback preferring certain people and eliminating others. However, this was not central in this study and therefore a further study with more focus on the abovementioned aspects is therefore suggested. Moreover, research is also needed to understand further teachers' motivation to use the system and whether their motivation could have been related to their certainty and feedback-seeking frequency.

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