E-Learning at Work and the Workplace
From Education to Employment and Meaningful Work with ICTs
Proceedings of the European Distance and E-Learning Network 2014 Annual Conference
Zagreb, 10-13 June, 2014
ISBN 978-963-89559-7-5
ISSN: 2707-2819
doi: https://doi.org/10.38069/edenconf-2014-ac-0060

DISTINCTIONS BETWEEN COMPUTER SELF-EFFICACY OF PUPILS AND TEACHERS IN ELEMENTARY SCHOOL

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Abstract

The aim of this study was to establish whether there are differences between the computer self-efficacy of pupils and teachers (N = 507) in the context of the classroom, as a developing workplace of the teacher in elementary education. The survey covered 184 teachers and 323 pupils in elementary school. The results show that there is no statistically significant difference in the Basic Computer Skills dimension. In other words, both pupils and teachers assess their own self-efficacy in Basic Computer Skills equally. Further, the results show a statistically significant difference of the medium effect size in Media-Related Skills. In other words, pupils assess their self-efficacy in this dimension higher than the teachers. The results also reveal a statistically significant difference in the medium effect size concerning the self-efficacy dimension of Web-Based Skills, i.e. the pupils' assessment of self-efficacy in the skill of internet use is higher than the teachers' assessment of self-efficacy in the same area. The results also show that pupils generally assess their computer self-efficacy more highly than the teachers do, which may be explained by the fact that these pupils are digital natives, belonging to what is known as the Net Generation, while their teachers are known as digital immigrants. This paper explains the implications of these results for modern multimedia student-centred classes, and the role of the pupil and teacher in such classes.

Introduction

The workplace of a teacher in primary and lower secondary education (in state and private schools, or as a tutor) is specific in terms of the use of new media (new digital technologies). What is specific is that today's teachers organise the classes where pupils who were born in the new digital multimedia environment learn. Prensky (2001) calls these generations of pupils digital natives, also recently identified as the Net Generation (e.g. Tapscott, 1999; Dziuban et al., 2010). Due to the characteristics of the multimedia environment in which these pupil generations were born and their informally developed competences in using the new media, these generations require a significantly different organisation of classes. These pupils require active methods of learning, and pupil-centred classes where they construct their own knowledge by interacting with the environment. In these kinds of classes, the teacher acts as a facilitator of the pupils' activities and the co-constructor of their knowledge. The significance

of modern pupil-centred classes is that they are organised, among other things, with the help of new media. This justifies the comparison between the teachers' competence in using new media and that of the pupils of the Net Generation. This is pertinent given the fact that some teachers have a lower level of competence in using new media, which calls into question the possibility of organising classes that satisfy the needs of today's pupils. Therefore, lifelong learning has become highly significant for a teacher's workplace, especially when it comes to in-service lifelong learning *for* and *with the help of* new media. The teacher's workplace allows teachers to learn in parallel with their pupils when organising classes with new media. This type of lifelong learning (of teachers, but also of pupils) is defined as situated learning, which is explained by the situated learning theory.

Situated learning (Brown, Collins & Duguid, 1989; Lave & Wenger, 1996) which follows up on the postulates of activity theory (Engeström, Miettinenand & Punamäki, 1999; Leonyev, 2009) derives from the domain of constructivist theories of learning and is based on processes stimulating mainly informal and active learning, i.e. constructing learning. In line with this, learning is viewed as a social process of (co-)construction and reconstruction of knowledge in a social (cultural and historical) and physical (multimedia) environment. In addition to being an excellent framework for explaining lifelong learning (among other places, also in the workplace), situated learning is also significant from the new media aspect, especially when it comes to social media (generally, Web 2.0) (McDougall et al., 2010). New media require the user to be active, to research, to communicate and manipulate objects, etc., which are some of the elements of situated, or (socio) constructivist, learning. Situated learning is a learning process that appears simultaneously in work-related situations (e.g. in the workplace) where the learned abilities, values, skills and knowledge must also be applied (Brown, Collins & Duguid, 1989). Collins (1988, p.2) defines situation learning as:

> *"the notion of learning knowledge and skills in contexts that reflect the way the knowledge will be useful in real life".*

One of the main features of situated learning is participation (Lave & Wenger, 1996), and what is known as a community of practice. This shows that situated learning is a learning process where, by applying what has been learned in real-life situations and by interacting with the social and physical (multimedia) environment, one learns and simultaneously applies what has been learned. The application of what has been learned activates new learning. Thus, a person (teacher) in his or her learning (work) process becomes what is known in didactic theories as a reflective practitioner (Appleby et al., 2010), which is one of the specificities of the teaching profession and the classroom as the teacher's workplace. According to Herrington, Oliver and Herrington (2007), learning situations are those that:

1. provide authentic contexts that reflect the way the knowledge will be used in real life;
2. provide authentic activities;
3. provide access to expert performances and the modelling of processes;
4. provide multiple roles and perspectives;

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5. support collaborative construction of knowledge;
6. provide opportunities for reflection;
7. provide opportunities for articulation;
8. provide coaching and scaffolding; and
9. provide authentic assessment. The teaching process, as a targeted and joint activity of the pupil and teacher, possesses all the above-stated characteristics of situated learning.

What has turned out to be significant in the context of teachers' lifelong learning in the workplace with the help of new media is also their motivation, which is affected by their perception of their own computer self-efficacy. Computer self-efficacy may also be significant for teachers in view of the fact that they work with children of the Net Generation who were born in the multimedia environment and have very highly developed competences in using new media. In the context of situated learning, as an operative form of lifelong learning, computer self-efficacy is a very important factor for teachers since they learn, among other things, also in collaboration with their pupils with the help of new media.

Computer self-efficacy

What is significant for using new media at work (in this case, in class) is the very decision to organise learning with the help of new media. According to Moos and Azevedo (2009), motivation also affects the decision to (successfully) use and learn with the help of new media. This motivation, among other things, expresses itself as perceived self-efficacy in using new media. In other words, when using new media to organise classes and learning, and in the workplace, what is important is (perceived) computer self-efficacy. The theory of computer self-efficacy is not completely original. It derives from Bandura's theory of self-efficacy (1977). Computer self-efficacy concerns one's own perception of the ability to use a computer in order to successfully perform a particular task (Murphy, Coover & Owen, 1989). The computer self-efficacy theory is also useful to explain the successful performance of work tasks, as well as learning with the help of computer technologies, because it is applicable in different social situations where people use IT, including in the workplace.

Thus, Hill, Smith and Mann (1987) were amongst the first to carry out research of computer self-efficacy in order to find the relation between computer self-efficacy and the decision to use a computer. The study was conducted on 304 pupils. The results show that higher computer self-efficacy is related to more positive and more frequent experience in using the computer, as well as with future more frequent use of the computer and other digital technologies. In the end, the authors conclude that the use of a variety of IT can be predicted through computer self-efficacy based on positive and frequent previous uses of the computer. Whitley (1997) obtained interesting results in a meta-analysis of computer self-efficacy and computer perceptions in the territory of Canada and the USA on a sample of secondary-school pupils on one hand, and university students and adults on the other hand. The results of the analysis showed that pupils in higher secondary education had a more positive affective perception of computers and a higher level of computer self-efficacy than university students

ISBN 978-963-89559-7-5

and adults. Brosnan (1998) carried out a survey on computer-related anxiety and computer self-efficacy and their effect on the performance of tasks on a computer using a sample of 50 students in the UK. The results of the survey show that the lower the computer-related anxiety, the larger the number of resolved tasks; and the higher the level of computer self-efficacy, the more students are able to predict particular actions and control work on the computer. Salanova et al. (2000) carried out a study on the effect of the level of training for work on the computer and the frequency of the use of computers and computer self-efficacy on work burnout in Spain on a sample of 140 adults working on a job requiring the use of IT. The results show that better training in using the computer and more frequent use of the computer may be considered as predictors of a higher level of computer self-efficacy. Further, persons with a low degree of computer self-efficacy more often exhaust themselves in circumstances where they have to frequently use the computer. The results show that a higher degree of computer self-efficacy in jobs that require the use of IT may reduce the work burnout syndrome. Potosky (2002) conducted a survey on the perception of computer self-efficacy as an outcome of computer training in 56 respondents with specific knowledge and skills in using the computer at work, and their computer playfulness. The results show that a perception of higher abilities and knowledge of application is related to a higher degree of computer self-efficacy. Moreover, the results indicate that a higher degree of computer playfulness and a better perception of one's knowledge may be considered predictors of a higher degree of computer self-efficacy. It was also shown that respondents who express a higher degree of computer playfulness have a higher degree of computer self-efficacy. Deng, Doll and Troung (2004) conducted a survey on the significance of computer self-efficacy in new and unknown situations of applying IT on 153 IT engineers. They wanted to grasp the significance of personal autonomy, cooperative support and learning capacities in computer self-efficacy. Their further goal was to find out the relation between computer self-efficacy and intrinsic motivation in conjunction with the efficient use of IT. The result was that intrinsic motivation has a significant effect on computer self-efficacy in the successful resolution of tasks. Furthermore, a person's autonomy, his or her ability to learn (the ability to adapt) and collaborative assistance (the assistance of associates) also have a significant role on the application of IT in new and unknown situations to resolve particular tasks. This shows that computer self-efficacy still has a significant role in the use of computers and in resolving IT-assisted tasks, but this is not restricted to previous experience in using the computer, since there are also other determinants, such as personality traits, learning ability, ability to work in a team, etc.

These theoretical concepts and research results show that the nature of the teacher's workplace, i.e. the classroom, conforms to the postulates of situated learning. On the other hand, lifelong learning happens *in situ* at the workplace. As far as the teacher is concerned, this is the classroom where such processes of work and learning occur in cooperation with the pupils. In addition, it is impossible to view the modern organisation of Net Generation pupil-centred learning outside the context of the use of new media. Therefore, it is fair to compare the teacher's and the pupils' competence in using the new media, that is, their computer self-

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efficacy, which, according to the above-mentioned research, may be significant for the organisation of work (teaching in class), but also for the teacher's workplace itself.

Therefore, this research was conducted with the purpose of comparing computer self-efficacy in teachers and pupils in elementary school.

Method

Sample

The sample (N = 507) consists of elementary school teachers and pupils, including 323 eighth-grade pupils and 184 class and subject teachers in Croatia. In terms of the pupil subsample, there were 157 (48.6%) male pupils, and 166 (51.4%) female pupils. In terms of the teacher subsample, there were 23 (12.5%) male teachers, and 161 (87.5%) female teachers. A total of 73 (39.7%) teachers work in town schools and 111 (60.3%) work in village schools. In terms of their workplace, 66 (35.9%) are class teachers, 116 (63.0%) are subject teachers, and 2 (1.1%) work in extended stay programmes. With regard to their experience, it ranged from total beginners (0 years of work experience) to 44 years of professional experience, which gave an average of 15 years of professional experience.

Instrument

The computer self-efficacy scale (Teo & Ling Koh, 2010) consists of twelve manifest items. Each item was measured on a five-point Likert scale with (1= strongly disagree; 2 = mainly disagree; 3 = undecided; 4 = mainly agree; 5 = fully agree), made up of three latent factors. The Basic Computer Skills factor contained five manifest statements, the second factor, Media-Related Skills contained four manifest statements, and the Web-Based Skills factor contained three manifest statements. The instrument was constructed in such a way that it was decontextualised with regard to any individual digital device. An explanatory factor analysis of principal components was carried out, with saturation points exceeding 0.3, and by using the oblim rotation, with the aim of assessing the construct validity. Bartlett's test of sphericity amounted to 0.000, and KMO = 0.915. Three factors emerged as in the original structure of the instrument, which jointly explain 72.62% of the total variance. The Basic Computer Skills factor explains 49.27%, the Media-Related Skills factor 18.39%, and the Web-Based Skills factor 4.95% of the total variance. One statement from the Basic Computer Skills factor had a significant saturation in the Media-Related Skills factor. This shows that the instrument replicates the original factor structure on the sample of Croatian respondents in a satisfactory manner, although the original structure was used in the order and with a number of manifest statements concerning some factors according to Teo and Ling Koh (2010). Satisfactory reliability was achieved in all the factors. The Basic Computer Skills factor shows a reliability of $\alpha = 0.883$ (M = 4.294; Sd = 0.900; min = 1; max = 5); the Media-Related Skills factor $\alpha = 0.880$ (M = 3.011; Sd = 1.194; min = 1; max = 5); and the Web-Based Skills factor $\alpha = 0.779$ (M = 3.143; Sd = 1.201; min = 1; max = 5).

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Procedure

The research was carried out from February to April 2013. Both subsamples filled in the survey questionnaire by using the paper-pencil method. The completion of the questionnaire was fully voluntary and anonymous.

Results

In view of the aim of the research and the structure of the applied instrument, the results are analysed in two steps. The first step consists of an analysis of the difference related to the overall concept of computer self-efficacy. The second step, with a view to obtaining results that are as detailed as possible, consists of an analysis of differences by each separate factor of computer self-efficacy. By applying the Mann-Whitney U test, a level of significance of $p < 0.01$ showed that there is a statistically significant small difference in computer self-efficacy (on the entire instrument) between pupils and teachers ($U = 20318.50$; $p = 0.00$, $Z = -5.927$; effect size $r = 0.263$). In other words, the pupils ($M = 3.744$; $Sd = 0.916$; Mean Rank = 283.1; $Md = 3.91$) perceive a higher level of computer self-efficacy than the teachers do ($M = 3.287$; $Sd = 0.806$; Mean Rank = 202.9; $Md = 3.33$). Descriptively analysed, although pupils assess their computer self-efficacy higher than the teachers, the arithmetic means show that both subsamples assess it as mediocre in general. With a further analysis of differences with regard to any latent dimension of computer self-efficacy, the following results were achieved. There is no statistically significant difference in the dimension of Basic Computer Skills ($U = 27586.0$; $p = 0.169$, $Z = -1.374$; effect size $r = 0.061$), i.e., pupils ($M = 4.224$; $Sd = 0.954$; Mean Rank = 247.4; $Md = 4.6$) and teachers ($M = 4.409$; $Sd = 0.789$; Mean Rank = 265.6; $Md = 4.8$) assess their own self-efficacy in Basic Computer Skills equally. Although there is no difference, the arithmetic means show that both samples assess their Basic Computer Skills as above average. A further result is that there is a statistically significant difference in the medium effect size in Media-Related Skills ($U = 16013.0$; $p = 0.00$, $Z = -8659$; effect size $r = 0{,}384$), i.e., pupils ($M = 3.362$; $Sd = 1.129$; Mean Rank = 296.4; $Md = 3.5$) assess their self-efficacy in this dimension higher than the teachers ($M = 2.406$; $Sd = 1.043$; Mean Rank = 179.5; $Md = 2.25$). The arithmetic means show that pupils assess their Media-Related Skills as average, while teachers assess themselves as below average. It also resulted that there is a statistically significant difference in the medium effect size with regard to the Web-Based Skills dimension ($U = 17693.50$; $p = 0.00$, $Z = -7.610$; effect size $r = 0.337$), i.e., pupils ($M = 3.744$; $Sd = 0.916$; Mean Rank = 291.2; $Md = 3.67$) see their self-efficacy in using the internet as higher than the teachers ($M = 2.590$; $Sd = 0.806$; Mean Rank = 188.7; $Md = 2.67$). The arithmetic means show a tendency for pupils to consider their Web-Based Skills as above average, while teachers consider their own Web-Based Skills as below average or average.

Discussion

The results show that in general pupils assess their computer self-efficacy more highly than the teachers, which can be explained precisely by the fact that these pupils are digital natives, also identified as the Net Generation, while teachers are what Prensky (2001) calls digital

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immigrants. These results are in line with the results of Whitley's (1997) meta-analysis, which indicate that younger generations, or pupils, show a higher level of computer self-efficacy than the older generations, or teachers. Therefore, this result is a fair one, especially since these pupils were born in a multimedia digital environment and have not experienced (lived through) the development and transformation of ICT and the multimedia environment in general. This transformation and the associated sudden changes may be stressful, which can explain the lower computer self-efficacy of teachers.

Naturally, these results must be interpreted cautiously, especially with regard to further analyses related to each specific dimension of computer self-efficacy. Thus, it shows that there is no difference between pupils and teachers in basic computer skills, such as searching for information on the web, using writing programs (e.g. Microsoft Word), using spreadsheets and displaying data (e.g. Microsoft Excel) and in using email. This result is justified by the fact that these abilities have become necessary for everyday life. The probable reason for both subsamples to assess these skills as average is precisely because these are regular (basic) computer skills.

On the other hand, the results show that pupils express a higher level of computer self-efficacy in the skills of using various types of computer software (Media-Related Skills), such as editing programs for designing websites, programs to make video and audio recordings, graphic design and animation programs. They also show that pupils have a higher level of computer self-efficacy than their teachers when it comes to Web-Based Skills, such as blogs and personal profiles on social networks (e.g. Facebook, Twitter), using video conferencing online programs (e.g. Skype) and online learning platforms (e.g. Moodle). Although account must be taken that these differences are not large, which is shown by the effects size, they are moderate. These results are explained by the fact that these are skills inherent to today's children in their everyday social communication and socialisation, which, to a large extent, takes place through new media. These skills are essential for the needs of today's children, and skills that Ito et al. (2010) consider "normal" for the children of today in their needs, such as friendship, play, work, family, intimacy and creativity. In other words, in order for today's children to satisfy their social needs, they also need these abilities. These arguments, as well as the complexity of use of computer programs and the internet, are possible reasons for pupils to consider that their Media-Related Skills and Web-Based Skills are higher than the same skills of the teachers, since they assess their skills as average, as opposed to the teachers who assess them as below average. These abilities are also used by pupils in the context of social media, which include activities such as playing, showing, simulating, multitasking, negotiating, networking, evaluating, etc., which are some of the features of the participating culture mentioned by Jenkins (2006), and it is precisely this participating culture, according to Lave and Wenger (1996), that is one of the key elements of situated learning.

A comment must be made about these results in that it should be taken into consideration that both pupils and teachers show a higher level of computer self-efficacy in Basic Computer Skills in comparison to Media-Related Skills and Web-Based Skills, which is shown by the arithmetic means of all subsamples. This can be explained by the fast development and

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changes of computer software and social media, which always require new and different user skills. These computer abilities have not been acquired by pupils in formal education, but rather by informal social participation in the multimedia environment, or situated learning. Therefore, in view of these results, it is justified to consider that today's pupils, as opposed to their teachers, generally show better abilities in situated learning with the new media, which is one of the key characteristics of the teacher's workplace (class).

Conclusion

The research shows that pupils in general express a higher degree of computer self-efficacy than their teachers. Teachers and pupils assess their self-efficacy in basic computer skills equally, since these skills have become essential in everyday life. Pupils show a higher level of self-efficacy in using special computer software and higher skills in using the web, since these skills allow pupils today to engage in social communication and socialisation, and they meet their social needs, which confirms they have the characteristics of the Net Generation. It follows that the teacher's workplace (class) in terms of the multimedia (learning) environment includes the organisation of the learning experience for pupils who have identified themselves with the digital multimedia environment. Therefore, modern pupil-centred teaching also implies the organisation of teaching with new media. Since teachers in general show a lower level of computer self-efficacy, which according to today's research is significant for this workplace, the quality of teaching is brought into question. This sets certain challenges before teachers and their workplace in the form of lifelong learning and professional development. Teachers can achieve a high quality of teaching with new media by simultaneously learning how to use and by applying new media in organising classes, which takes place in the context of situated learning. These results also show that future teachers in initial training in teacher education studies have to be prepared to organise pupil-centred classes with new media based on the theory offered by multimedia didactics.

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