Trainee teachers' intention to incorporating ICT use into teaching practice in relation to their psychological characteristics: The case of group-based intervention

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Abstract

Personality traits and other psychological variables have been found to influence the use of technology as well as group functioning and effectiveness. In this study it is hypothesized that the Big Five Inventory (BFI) personality traits and psychological variables are related to teachers’ willingness to incorporate ICT into their teaching practices, as well as to within group interactions and outcome. The study employs a pre- and post- intervention research design, consisted of a training program in ICT in Education offered to a sample of 109 undergraduate trainee teachers which was divided into experimental (homogenous & heterogeneous) and control groups based on their personality traits and psychological characteristics, in order to examine the significance of these traits’ configuration in work groups, their intention to incorporate ICT into their future teaching practice and the quality of within group cooperation. Preliminary results revealed individual differences concerning gender and anxiety as well as group differences in favour of heterogeneous groups.

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1. Introduction

The Information and Communication Technology (ICT) prevails as one of the milestones of the modern educational system. A prolific stream of research provides evidence as to the positive effects of the use of ICT on students’ learning as well as on teachers’ professional development in line with the educational demands of the twenty-first-century knowledge society (Kreijns, Vermeulen, Kirschner, Buuren, & Acker, 2013). Various forms of ICT implementation in education expand opportunities for flexible and up-to-date learning and also reinforce teachers’ reflection and collaboration, the latter having been suggested as key components for teachers’ career development (Lawless & Pellegrino, 2007). Yet, ICT use has not become an integral part of classroom practices. Consequently, teacher education programs have a substantial role to play in preparing graduates for ICT uptake in schools. Teachers’ ICT training programs are designed in different cultural contexts with a unanimous aim to foster positive attitudes to computers among teachers as well as to enhance their skill levels in the integration of ICT into teaching practices. Indeed, teachers’ self-efficacy and levels of confidence in using ICT have been constantly found to be common enablers for prospective ICT integration (Albion, 1999; Bakar & Mohamed, 2008; Becta, 2004; Hammond, Reynolds, & Ingram, 2011; Rachel & Fordham, 2004; Sang, Valcke, Braak, & Tondeur, 2010). On the other hand, studies on trainee teachers’ attitudes to and beliefs about using ICT in the classroom have yielded inconsistent findings on the role of attitudes on teachers’ intention to incorporating ICT. Serving as a plausible explanation of these contradictory results, it has been stressed that it is important to differentiate between attitudes toward ICT generally and ICT as an educational tool (Player-Koro, 2012). The attitudes toward using ICT as a behavior rather than as an object better predict trainee teachers’ intention to use ICT in their teaching practices (Zhang, Aikman, & Sun, 2008). In any case, self-efficacy and attitudes are suggested to be mutually related to teachers’ ICT use (Player-Koro, 2012), taken also into account that attitudes are moderated by further subjective psychological and personality characteristics (Kounenou, Roussos, & Yotsidi, 2013; Roussos, 2007).

Despite the foreseen benefits of incorporating technology into the teaching practices and irrespectively of the prominent training strategies of ICT skills and positive attitudes development, many educational programs present limitations on their effectiveness to induce, or even increase, student teachers’ willingness to use ICT into classroom activities (Chai, Hong, & Teo, 2009; Ertmer, 2005; Haydn & Barton, 2007; Sang, Valcke, Braak, & Tondeur, 2010; Barton & Haydn, 2006; Mumtaz, 2000). An additional factor that seems to shape trainee teachers’ intention for prospective ICT use is related to teachers’ broader pedagogies (Cox, 2003). For example, in a study examining the encouragers of student teachers’ use of ICT during a 1-year initial teacher education programme it was revealed that there were different groups of trainees in relation to their intention for ICT use. Indeed, the variation of ICT use among student teachers was, among other factors, also related to teachers’ pedagogical belief that ICT is beneficial to learning (Hammond, Reynolds, & Ingram, 2011). Together with wider social and cultural factors influencing ICT usage by teachers (Somekh, 2008) and the role of pedagogical aspects in the ICT courses (Veen, 1993), several models have been suggested with the aim of explaining the existing incongruence between the demand for and teachers’ unwillingness to embed ICT in schools. An innovative one is the Integrative Model of Behaviour Prediction (IMBP) (Kreijns et al., 2013). IMBP is concerned with the use of specific ICT tools rather than ICT in general and explains intentional ICT implementation as resulting from teachers’ dispositional variables, such as attitudes, self-efficacy and subjective norms. Similarly, the application of self-determination theory in the information systems field contributes to explaining teachers’ motivation to continue to use technology by means of constructs that represent users’ basic psychological needs including perceived autonomy, perceived competence and perceived relatedness (Sorebo, Halvari, Gulli, & Kristiansen, 2009). Thus, the intention to integrating ICT into teaching practices entails a dynamic process involving teachers’ cognitive attributes (i.e. competence and self-efficacy in ICT use, attitudes, beliefs), but also professional and personal variables as well.

With regard to teachers’ professional factors, evidence reveals that subject matter and teaching experience are strongly associated with the beliefs teachers hold about ICT in education as well as with their confidence to integrating ICT in teaching (Bakar & Mohamed, 2008; Jimoiyannis & Komis, 2007), while teachers’ gender has an effect on the degree to which they use ICT (Bakar & Mohamed, 2008; Becta, 2004; Hennessy, Ruthven, & Brindley, 2005). Contradictory evidence exists with regard to the role of teachers’ age in ICT use (Braak, 2001a; Bradley & Russell, 1997; Bakar & Mohamed, 2008). These juxtaposed findings could be possibly explained by further individual characteristics that pertain more to teachers’ personality. However, psychological individual
characteristics have been studied to a limited degree (Braak, 2001a) and personality factors that may contribute to teachers’ e-teaching readiness have been largely neglected (Karpati, Torok, & Szirmai, 2008). Recent findings suggest that among the personality variables that predict intention for classroom technology use are teachers’ openness to change (Perkmen & Cevik, 2010; Rachel & Fordham, 2004), general and especially technological innovativeness (Braak, 2001a, 2001b) and extroversion, while conscientiousness has also been found to be positively related to teachers’ motivation (Perkmen & Cevik, 2010). These results resonate with the key feature of ICT, namely its ever-changing nature (Hammond, 2004). Additionally, it has been revealed that those trainee teachers who are socially adaptive, tolerant and friendly present high level of ICT competence, in terms of acquiring positive attitudes towards and skills of technology, and making good use of ICT tools and methods (Karpati, Torok, & Szirmai, 2008).

The emerging role of teachers’ personality traits on enabling ICT integration in schools has incited the need for developing social skills and group work among teachers. ICT teacher training courses endorse, nowadays, a group based approach for accelerating ICT skills development (Atwell, Dirckinck-Holmfeld, Fabian, Karpati, & Littig, 2003), following the general trend of cooperative learning in education that is believed to cultivate motivation through peer collaboration (Dornyei, 1997). In this vein, a new area of study has emerged in the field, termed Computer-Supported Collaborative Learning (CSCL) (Paredes & Rodriguez, 2002). However, no research up to now has explored the role of teachers’ personality in group based ICT training courses. Besides, educational literature lacks models of effective teamwork (den Bossche, Gijselaers, Segers, & Kirschner, 2006). This lack of evidence contradicts with ample data showing that group operation (e.g. team communication and co-operation, Davies & Kanaki, 2006) and group effectiveness largely depend on the personality characteristics among group members (Barrick & Mount, 1991; 1993; Halfhill, Sundstrom, Lahner, Calderone, & Nielsen, 2005; Peeters, Van Tuijl, Rutte, & Reymen, 2006). The Big Five model (Costa & McCrae, 1992) is the most well-known and scientifically rigorous one in exploring group personality diversity on the basis of five parsimonious traits, namely openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism. Still, it remains ambiguous whether homogeneity or heterogeneity based on personality traits in group formation is better off in relation to group interactions and outcome. Some evidence reveals that when groups are homogeneous in conscientiousness and agreeableness, there are good levels of persistence in goals, commitment to the group, cooperation among the members and effectiveness, but there is a lack of innovative thinking in the group (Barrick & Mount, 1991; Barry & Stewart, 1997; Bell, 2007; Halfhill et al., 2005; Witt et al., 2002). On the other hand, when the team members differ in openness to experience and extraversion, then this heterogeneity positively affects team performance, especially when the task demands creativity and originality (Mohammed & Angel, 2003). Yet, the personality trait of extraversion contributes more in team building when teams are homogeneous, rather than heterogeneous (Bowers, Pharmer, & Salas, 2000).

Based on the above evidence, personality traits both at an individual level but mostly at a group level appear to shed light in how groups work on innovative tasks, such as the development of ICT skills by trainee teachers who participated in a group based intervention. In this study it is hypothesized that the Big Five (BF) personality traits and psychological variables such as self-efficacy, anxiety and attitudes towards ICT use are related to student teachers’ willingness to incorporate ICT into their teaching practices, as well as to within group interactions such as cooperation.

2. Method

2.1. Participants

The sample consisted of 109 trainee teachers distributed into separate training groups of three: 4 homogeneous, 4 heterogeneous, 22 semi-homogenous and 7 control groups based on the aforementioned specific psychological factors. More specifically, groups were formed according to levels of neuroticism, openness to experience, extraversion, conscientiousness, attitude and anxiety towards computer use and computer self-efficacy. Variables such as gender and familiarity with computer use were also taken into consideration. The experimental groups were homogeneous and heterogeneous in order to explore potential differences in effectiveness concerning group work.
and task accomplishment while members in control groups were distributed in a random way. All types of groups were offered education by specialists on IT in Education.

2.2. Instruments

The psychological measurement instruments that were used in this study consisted of: 

The Big Five Questionnaire (BFQ-2), a questionnaire assessing the Five Factor personality model that was constructed by Caprara, Barbaranelli & Borgogni (1993) and was translated and standardized in Greek by Ison Psychometrica (2010). The specific inventory consists of 134 items measuring five broad dimensions (24 items each), 10 sub-dimensions (12 items each, 2 per broad dimension), and one Lie scale, which consists of 14 items. The main scales that are being assessed are:

a. Energy: is defined by the two sub-dimensions Dynamism (Di) and Dominance (Do).

b. Friendliness: defined by the two sub-dimensions Cooperativeness/Empathy (Cp) and Cordiality/Friendly attitude (Co).

c. Conscientiousness: defined by the two sub-dimensions Scrupulousness (Sc) and Perseverance (Pe).

d. Emotional stability: defined by the two sub-dimensions Control of Emotion (Ce) and Control of impulses (Ci).

e. Open- mindedness: defined by two sub-dimensions Openness to culture (Ac) and Openness to experience (Ae).

The internal consistency of the questionnaire scales and subscales (Cronbach’s α coefficient) was found between .70 and .90.

The Greek Computer Attitudes Scale (GCAS; Roussos, 2007) - 30 items and 3 subscales measuring confidence, affection and cognitive. Analyses of the GCAS data collected from all samples indicated internal consistency (coefficient alpha) reliability coefficients between .90 and .94. The test-retest data yielded a statistically significant, positive correlation \[r=.83, p<.001\]. The concurrent validity of the scale was calculated by correlating the scores on the scale to the participants’ previous computer experience (independent criterion measure). Pearson’s correlation was performed on the GCAS and computer experience data and a significant correlation was found on both cases \[r(294)=.66, p<.001\] and \[r(87)=.57, p<.001\] for samples 2 and respectively.

The Greek Computer use Self-efficacy Scale (GCSES; Kassotaki & Roussos, 2006) - 29 items and 2 subscales measuring competency in basic knowledge on the use of operational systems, internet applications, basic concepts and dealing with simple problems related to computer use. Analyses of the GCSES data indicate internal consistency reliability coefficients between .93 and .97.

Computer Anxiety Scale (CAS; Roussos, 2006) - 15 items: Internal consistency reliability coefficient was \(\alpha=.91\). Convergent validity was calculated by correlating CAS data with two similar scales: CARS \([r(293)=.98, p<.01]\) and CATS \([r(293)=0.89, p<.01]\).

Questionnaire on in-group Co-operation. A questionnaire was constructed by Kounenou, Papanikolaou, & Roussos (2013) in order to assess in group cooperation. It consisted of 29 Likert items and 3 subscales assessing: a) what the group members considered as important during group work and the degree of importance (5 items), b) which of the factors assessed by the previous subscale satisfied group members during group work and the degree of satisfaction (5 items), and c) ways of each member’s involvement in group work and the degree of involvement (18 items). The internal consistency of the questionnaire subscales was found \(\alpha=.85, .81, .94, .94, .93, .40\) respectively.

Questionnaire on Intention to future ICT integration in teaching practice. A questionnaire was constructed by Kounenou, Papanikolaou & Roussos (2013) in order to assess trainee teachers’ intention to integrate ICT use into their future teaching practice. The trainees were asked to consider themselves as actual teachers and assess: a) the degree of their willingness, b) the frequency of future ICT use, c) types of ICT that they intend to use, and d) the degree of importance of various parameters that could facilitate trainees to integrate ICT into their future teaching practice (11 items). The internal consistency of the quantitative part of the tool was \(\alpha=.78\) (pre-intervention measure) and \(\alpha=.97\) (post-intervention measure).
2.3. Procedure

The study employs a pre- and post-intervention research design. The intervention consisted of a training program in ICT in Education offered by a teaching group of specialists on ICT in education. The ICT training intervention combined blended learning with learning design (i.e. blended learning scenarios), as an alternative teacher training approach that integrates online experiences into face-to-face learning. The effectiveness of the intervention was investigated on the basis of the “Technological Pedagogical Content Knowledge” – TPACK (Mishra & Koehler, 2006) taking into consideration the trainee teachers’ learning design products, rather than their opinions about the impact of the intervention (Chai, Koh, & Tsai, 2013). Evaluation criteria addressed all knowledge fields of TPACK (e.g., technological knowledge, pedagogical knowledge, technological content knowledge, etc.) and both trainee teachers’ and their instructors’ assessments were included (Gouli, Papanikolaou, & Makri, 2014).

3. Results

In order to test student teachers’ willingness to incorporate ICT into their teaching practices, their responses on the Questionnaire on Intention for future ICT integration before and after the intervention were compared. Descriptive statistics for these comparisons are presented in Table 1.

<table>
<thead>
<tr>
<th>Questionnaire on Intention for future ICT integration</th>
<th>N</th>
<th>Mean</th>
<th>s.d.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question 1 (Pre)</td>
<td>100</td>
<td>2.58</td>
<td>1.4</td>
</tr>
<tr>
<td>Question 1 (Post)</td>
<td>100</td>
<td>1.97</td>
<td>3.1</td>
</tr>
<tr>
<td>Question 2 (Pre)</td>
<td>100</td>
<td>3.13</td>
<td>0.8</td>
</tr>
<tr>
<td>Question 2 (Post)</td>
<td>100</td>
<td>2.42</td>
<td>2.8</td>
</tr>
<tr>
<td>Part 4 (Pre)</td>
<td>100</td>
<td>2.88</td>
<td>0.6</td>
</tr>
<tr>
<td>Part 4 (Post)</td>
<td>100</td>
<td>2.60</td>
<td>1.8</td>
</tr>
</tbody>
</table>

Paired samples t-tests were performed on the means and the results showed that the only difference which was statistically significant [t(99)=1.48, p=.011] was that for question concerning the frequency of future ICT use. Interestingly, the post-intervention mean was lower indicating that students’ intention had dropped during the intervention. Further analyses which were conducted to test the interaction between group type and students’ intention to integrate ICT before and after the intervention revealed no significant results.

As far as the effect of group type on in-group cooperation is concerned, this was statistically significant only for the last part of the questionnaire (see Table 2).

<table>
<thead>
<tr>
<th>Part 4 of the Questionnaire on in-group Co-operation</th>
<th>N</th>
<th>Mean</th>
<th>s.d.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homogeneous</td>
<td>12</td>
<td>0.64</td>
<td>2.1</td>
</tr>
<tr>
<td>Heterogeneous</td>
<td>12</td>
<td>1.82</td>
<td>0.9</td>
</tr>
<tr>
<td>Homogeneous in only one personality trait</td>
<td>60</td>
<td>1.53</td>
<td>0.9</td>
</tr>
<tr>
<td>Control</td>
<td>15</td>
<td>1.69</td>
<td>1.0</td>
</tr>
<tr>
<td>Total</td>
<td>99</td>
<td>1.48</td>
<td>1.2</td>
</tr>
</tbody>
</table>

A one-way independent samples Analysis of Variance was performed on the means of Table 2 and its results [F(3, 95)=2.74, p=.048] showed that there was an effect of group type on students’ responses. This was due to the lower performance of the homogeneous group (see Figure 1).
Finally, when comparing students’ scores on attitudes towards computers, anxiety, and self-efficacy between the first and the second administration, the only statistically significant difference was found on CARS \([t(97)=2.07, p=.041]\). Specifically, the mean score of anxiety for the second measurement (mean=18.99) was lower than the first (mean=20.27). Effect of gender on students’ performance was significant only on the mean of the last part of the Questionnaire on Intention for future ICT integration (part D), where women’s scores (mean=1.1) were significantly lower than men’s (mean=2.0; \(t(93)=3.58, p=.001\)).

4. Discussion

The results of the study concerning the sample’s intention to incorporate ICT into their teaching practice showed that the students’ belief of how often they could use ICT in their class was much lower after the ICT intervention. As Barton and Haydn (2006) indicate, education programs in ICT use may not have the expected positive impact on the trainee teachers’ intention to integrating ICT into their prospective teaching practices due to the fact that students become so much overwhelmed with the extent of the training materials that, despite their learning products, they feel hesitant to put all this massive information into actual practice.

As far as the group formation concerns the results revealed that the members of the homogenous groups seemed to use less the ICT tools for their communication with each other in comparison to all the other types of groups. Literature so far has revealed that homogeneity versus heterogeneity is an interesting issue as far as relationship criteria are concerned. Moreover, Horreo & Carro (2007) showed that heterogeneous groups presented higher scores in satisfaction by being a group member than the homogenous ones.

Searching for individual differences the findings showed that females seemed to appreciate as less important the incorporation of the ICT into their future teaching practices than males. The specific result is consistent with those of other studies supporting that males are more confident in using ICT in class (Bakar & Mohamed, 2008; Becta, 2004; Hennessy, Ruthven, & Brindley, 2005). Also, the post intervention measure showed that anxiety towards ICT was significantly lower among the participants. However no statistically significant difference was found concerning self-efficacy and attitudes, revealing the fact that these two characteristics which are considered as more personality related variables were not influenced by the intervention.
Overall, teachers need to overcome their resistance to change traditional non-ICT pedagogical practices, with which they may anticipate to be more at ease in their everyday classroom routine (Cuban, Kirkpatrick, & Peck, 2001). To this end, ICT teacher training programs should enhance their perceptions that ICT has a positive impact on the learning process, especially in relation to improving students’ engagement (Hammond, Reynolds, & Ingram, 2011), but also in relation to fostering teachers’ communication and reflection in a cost-effective way (Owston, Sinclair, & Wideman, 2008). Evidence on the factors that influence teachers’ ICT literacy and motivation for ICT use in classroom supports that ICT integration is determined through a gradual process of pedagogical evolution (Hennessy, Ruthven, & Brindley, 2005) that needs to take into account a set of interrelated factors, both personal and relational ones.

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