

*Full Length Research Paper*

# **An analysis on the effect of computer self-efficacy over scientific research self-efficacy and information literacy self-efficacy**

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**Present research investigates reciprocal relations amidst computer self-efficacy, scientific research and information literacy self-efficacy. Research findings have demonstrated that according to standardized regression coefficients, computer self-efficacy has a positive effect on information literacy self-efficacy. Likewise it has been detected that information literacy self-efficacy positively affects scientific research self-efficacy. It has also been designated that computer self-efficacy has a positive impact on scientific research self-efficacy. It is suggested that the findings of present research shall provide assistance in detecting the sequence of computer, information literacy and scientific research skills development courses that shall be integrated into curriculums.**

**Key words:** Computer self-efficacy, information literacy self-efficacy, scientific research self-efficacy, teacher training, teaching and learning.

## **INTRODUCTION**

Recent studies have demonstrated that self-perceptions of learners have been investigated more frequently than ever today. One of these perceptions under focus is perception of self-efficacy. Learner's self-efficacies have constituted the key subject of the newest scientific researches. One of the reasons accounting for this rise might be ascribed to the fact that the contribution of modern learners to learning processes is actually higher than the contribution provided by teachers. Researches indicate that in today's educational system where student-centered approach is dominant learner quality and capacity stand as salient predictors of success. Therefore until the time learners' self-efficacy levels, attitudes and learning strategies are thoroughly demonstrated, the relevant researches shall be continued.

Bandura (1977) defines self-efficacy concept such: "*an individual's self-perception concerning his own capacity to organize and actualize required actions to reach a preset performance*". Snyder and Lopez (2002), on the other hand, report that self-efficacy is the response provided by individuals to the question "what am I capable of doing?" with one's own skills under certain conditions and one's self-faith and it is not one kind of skill that can be perceived or observed. Donald (2003) argues that the key expression in defining self-efficacy is "Am I capable of accomplishing this mission?" (Acar, 2007). Yi and Hwang (2003), in their study, report that in the categorization of human behaviors, self-efficacy provides significant data. On the other hand, Kinzie et al. (1994) claim that self-efficacy is the self-trust one person needs to feel when accomplishing a certain task that

demands effort and patience. In some researches that associate self-efficacy perception with performance it has been claimed that people with higher self-efficacy perception shall be more successful in overcoming the obstacles with passion and resolution (Bikmaz, 2004; Aşkar and Umay, 2001). In relevant literature there are some researches indicating that self-efficacy perception involves cognitive processes, feelings and controllable behaviors (Çetin, 2008), that it has an effect on acting appropriately or inappropriately and the level of perseverance in coping with the problems (Akkoyunlu and Orhan, 2003), that students with lower self-efficacy levels shall keep themselves distant from learning situation or task (Schunk, 2000).

It is deemed necessary that such views on self-efficacy must be, like many other sectors, analyzed with respect to education sector too and hidden facts related to learner and teacher self-efficacies must be enlightened. This research has been limited to computer, information literacy and scientific research self-efficacies. In terms of educational activities, one of the self-efficacies that need to be prioritized is computer self-efficacy. Teo and Koh (2010) classify prospective teachers' computer self-efficacies into three dimensions; basic computer skills, media-related skills and web-based skills. Guy and Jackson (2010), in their research, have manifested that within self-efficacy perceptions of students there emerges a differentiation with respect to computer knowledge and skill levels. On the other hand, Sam et al. (2005) have claimed that higher ratio of internet use is not alone sufficient in explaining computer self-efficacy. In a different research it has been ascertained that within computer self-efficacy perceptions of prospective teachers there is a differentiation with respect to their academic success (Özder et al., 2010). The researches of Bandura (1995), Emmer and Hickmen (1991), Gibson and Dembo (1984), Hoy and Woolfolk (1993), Ross (1992), Soodak and Podell (1998), Tschannen-Moran et al. (1998), Berkant and Tuncer (2010), Tuncer and Tanaş (2011), Aston (1984) and Enochs and Riggs (1990) are epitomes that can better explain self-efficacy concept.

As regards scientific research self-efficacy of prospective teachers which is a different kind of self-efficacy, the number of researches is limited. One of these researches has been conducted by Nartgün et al. (2008) and it has been detected in this research concerning scientific research self-efficacies, the difference has been in favor of prospective teachers who took scientific research methods course. A similar result has been obtained from Saracaloğlu et al. (2005) research and it has been detected that attitude towards the research has varied with respect to research experience, research methods, taking measurement and evaluation courses. In a different research it has been detected that self-efficacy perceptions of postgraduate

students are on medium level (İpek et al., 2010). Bard et al. (2000) claim that research courses students take have an accelerating effect on their research-oriented attitudes and research skills. It has also been detected that research methods course has had a rising effect on the levels of research self-efficacy (Lei, 2008; Unrau and Beck, 2004 quoted by Saracaloğlu et al., 2005); individuals with higher levels of research self-efficacy are more interested in participating in forthcoming researches (Bard et al., 2000; Bieschke et al., 1996; Kahn and Scott, 1997 quoted by Saracaloğlu, 2008). Taşdemir and Taşdemir (2011) have concluded that prospective teachers' efficacies related to problem situation of a scientific article, method, findings, conclusion and suggestions are in a lower level compared to the efficacy level of researches on spelling rules. Tuncer and Özeren (2012), as regards resource scanning dimension of scientific research self-efficacies, have detected a difference in favor of female prospective teachers; as regards method dimension the difference has been in favor of prospective teachers aspiring to further academic career. These research findings manifest that scientific research self-efficacy is under the effect of scientific research, measurement and evaluation courses, aspiration to further academic career and similar factors. Improvement of scientific research self-efficacies of teachers or prospective teachers shall impact their professional growth positively and contribute greatly to overcoming several problems.

The last self-efficacy type covered within the context of research is information literacy self-efficacy. In today's world in order for people to brilliantly execute their information-problem solving actions, to become self-guiding, motivating, and life-long learning individuals, they are expected to cultivate a positive self-efficacy perception on information skills (Akkoyunlu and Kurbanoğlu, 2002). Information literacy concept has been introduced for the first time at the onset of 1970s in a report projecting its integration with US National Education Program in the ensuing ten years. In this report, information literacy is explained as such: *"the ones who possess the skills to employ in their works information and information resources are information literates. People who are endowed with such skills are people who can learn life-long since they can solve their problems on the basis of information"*. In the course of time, this definition has gained a broader interpretation and started to be seen as the key to rise as a successful individual in information society (Polat, 2006). Snavely and Cooper (1997) argue that the adoption of information literacy concept has consumed some time. There are still some disputes related to the claim that this concept fails in fully representing the context and in particular the term "literacy" brings to mind different associations. At the end of these conflicts alternative concepts such as *Informa-*

*tion Fluency, Global Informatics, Information Competence, Information Discovery, Information Empowerment, Information Mapping Information Sophistication, Macroscopicism, Library Experience* have been introduced. However, it is hard to claim that these alternatives are more obvious and comprehensible than information literacy concept (Kurbanoğlu, 2010). Maybe that is why in his work *Information Literacy Topology*, McClure (1994) defines information literacy as a skill that includes all literacy concepts having emerged as an outcome of technological innovations. Horton (2008) cited in Kurbanoğlu (2010) classifies literacy skills which he deems to be vitally essential for the 21<sup>st</sup> century into six categories namely functional literacy, computer literacy, media literacy, distant learning and e-learning, cultural literacy and information literacy. He accentuates that these literacy groups are partially parallel but still they need to be viewed as complementary elements. Prior to this research a similar explanation has been provided by Kuhlthau (1987). He argues that information literacy must be associated with functional literacy and life-long learning concepts, and by the assistance of information literacy the need for information must be realized and decision-taking on the basis of information must be understood. Bundy (2004) extends the scope of information literacy and claims that information literacy is prerequisite for participatory citizenship, social acceptance, new information production, personal and organizational growth and lifelong learning. Aldemir (2004), on the other hand, has classified this description assortment in two dimensions; he explained the definitions in first dimension as definitions aiming to explain the nature of information literacy and the second dimensions as the definitions explaining the qualities an individual with information literacy must possess. Likewise Demiralay and Karadeniz (2008) have defined information literacy such "*in the process of solving information gain which starts with the ignition of feeling the need for information gain identifying information need with a scientific ethics, establishing research strategies, reaching information resources, reaching the required information from accessed information resources, analyzing the information, effectual interpretation and evaluation*" which is parallel to Aldemir's (2004) definition explained as second dimension.

Modern communities are required to fulfill a sufficient level in computer, information literacy and scientific research skills which also holds true for teachers and prospective teachers. As pointed out by Korkut and Akkoyunlu (2008) in contemporary world where technology is the dominant power it is impossible even to consider raising teachers without computer literacy; thus educational programs are expected to gain these detected skills. As underlined by Erich and Popescu (2010) because of the competition in labor force markets

students and employers are expecting a reform in curriculums. Albion (1999) claims that each teacher is required to integrate into his/her own curriculum technology courses. To that end, teachers must gain such skills both in their work life as well as by means of teacher training programs. In the same way, it is also suggested that information literacy be incorporated into curriculum (Chu et al., 2011; Eisenberg, 2007; Kuhlthau et al., 2007). Chen (2011), on the other hand, approaches this assertion from quite a different perspective. Based on research findings he claims that information literacy might provide suitable foundation to raise young children as lifelong learners; thus he associates information literacy training with quite a young age.

Lifelong learning and global educational movements have assigned certain responsibilities to learners and educational institutions. Learners are supposed to use learning to enhance their learning capacity, and by perceiving the amount of information and skills they need in work life they need to amend their misdeeds via personal efforts. The way for employees to fulfill their expected mission can only be possible by acquiring, in addition to many other skills, computer, information literacy and scientific research skills. That is because employers shall most of the times be more tolerant when employees correct their faults personally; in order to correct these failures they shall not demand scheduled training activities that might disrupt work life. As regards teachers in particular, when teachers are on a certain level of these skills they shall provide more brilliant academic services. At this point the main question to know is: what is the reciprocal effect of these skills and what is the level of this effect? The response to this question might be influential in raising the academic success of teachers while the same response might be effective in preparing prospective teachers for work life. That is the main objective of current research which analyzes reciprocal effects of computer, information literacy and scientific research self-efficacies with respect to prospective teachers.

### **Aim of the research**

Present research investigates reciprocal relations amidst computer self-efficacy, scientific research and information literacy self-efficacy. Therefore the following questions have been explored:

- i) Does computer self-efficacy affect scientific research self-efficacy?
- ii) Does computer self-efficacy affect information literacy self-efficacy?
- iii) Does information literacy self-efficacy affect scientific

**Table 1.** Exploratory factor analysis (EFA) results of CSE and IL scales.

Scale		Computer self-efficacy (CSE)			Bartlett's			
Dimens.	Eigen values	Variance (%)	Cumulative (%)	Cronbach Alpha	X <sup>2</sup>	df	Sig.	KMO
CSE-1	7.456	43.858	43.858	0.919	2310.14	136	0.000	0.90
CSE-2	1.540	9.061	52.919					
CSE-3	1.209	7.111	60.030					
CSE-4	0.952	5.601	65.632					

Scale		Information literacy self-efficacy (ILSE)			Bartlett's			
Dimens.	Eigenvalues	Variance (%)	Cumulative (%)	Cronbach Alpha	X <sup>2</sup>	df	Sig.	KMO
ILSE-1	5.320	31.297	31.297	0.861	1371.35	136	000	0.820
ILSE-2	2.065	12.146	43.443					
ILSE-3	1.518	8.928	52.370					
ILSE-4	1.074	6.315	58.686					

research self-efficacy?

## MATERIALS AND METHODS

### Data collection tools

Within the scope of research, three sets of scales have been utilized. Of all these scales 29- item computer self-efficacy scale developed by Murphy et al. (1989) and 17-item information literacy scale developed by Kurbanoglu et al. (2006) have been adapted into Turkish. Another scale implemented in this research is scientific research self-efficacy scale developed by Tuncer and Özeren (2012). The scale consists of 12 items and four-factor structure. Computer self-efficacy and scientific research self-efficacy scales are five-Likert type scales and scale items vary from I strongly agree (5), I agree (4), I am not sure (3), I disagree (2) and I strongly disagree (1). Information literacy scale on the other hand is a seven-Likert type scale of which items are graded as 7 = almost always true, 6 = usually true, 5 = often true, 4 = occasionally true, 3 = sometimes but infrequently true, 2 = usually not true, 1 = almost never true.

Turkish adapted computer self-efficacy and information literacy self-efficacy scale has received its final form via exploratory and confirmatory factor analysis. Scale adaptation procedures have been performed on different samples. Computer self-efficacy scale has been implemented on 268 prospective teachers and information literacy scale has been implemented on 220 prospective teachers via exploratory and confirmatory factor analysis. 29-item computer self-efficacy scale has been transformed into a 17-item, three factor structure at the end of scale adaptation procedure. 12 items have been eliminated due to insufficient item factor loads or cyclical formation of items. On the other hand information literacy scale has preserved its 17-item structure while it also possessed a four-factor structure. Exploratory factor analysis findings of Computer self-efficacy and information literacy self-efficacy scales have been summarized in Table 1.

As demonstrated in Table 1, KMO (Kaiser-Meyer-Olkin) value of CSE scale has been detected as 0.90 and KMO value of ILSE scale has been detected as 0.82. KMO is a test that compares the weight of observed correlation coefficients with the weight of partial correlation coefficients (Kalayci, 2005). In cases when KMO is smaller than 0.50 (Tavşancil, 2002) or smaller than 0.60 (Büyüköztürk, 2002) factor analysis can no longer be resumed. The

value Bartlett's sphericity test gains and its significance indicate whether or not variables are inter-correlated. In cases when Bartlett's sphericity test is above 0.05, factor analysis cannot be conducted (Şencan, 2005). In the light of these data it is ascertained that CSE and ILSE scales are appropriate for exploratory factor analysis.

The essential difference between exploratory and confirmatory factor analysis is related to the objective in data analysis (Gillaspay, 1996). Compared to exploratory factor analysis technique, confirmatory factor analysis is a further complex technique and it is a technique employed in further stages of researches in order to test any given theory on latent variables (Tabachnick and Fidell, 2001). Kahn (2006) has claimed that confirmatory factor analysis results assist the researchers in testing factorial invariance of scores received from samplings. Tuncer (2011), however, argues that in confirmatory factor analysis (CFA) it is tested whether a pre-established structure can or cannot be confirmed. CFA results of CSE and ILSE scales are as shown in Table 2.

As demonstrated in Table 2, X<sup>2</sup>/df ratio of both scales is below 3. Besides GFI, CFI, IFI and Agfi values are closer to 1, Rmsea and Srmr values are closer to 0.

### Sample

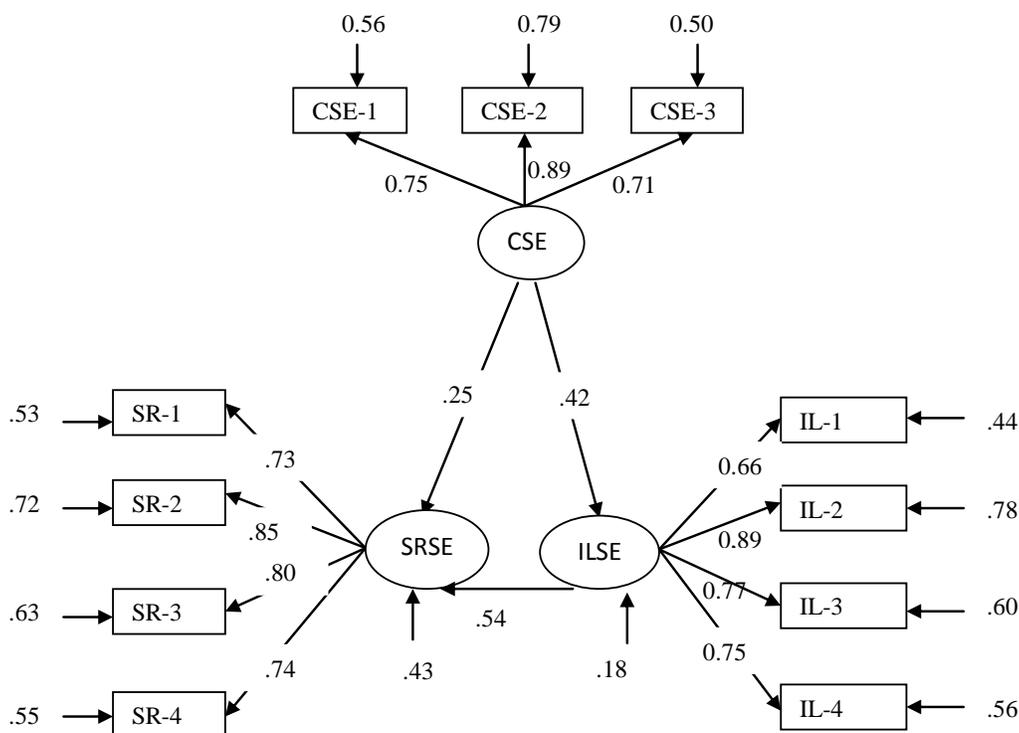
Scales have been implemented to 197 prospective teachers studying at Firat University, Faculty of Education. The distribution of the prospective teachers receiving the scale is 114 teachers (57.9%) are females and 83 (42.1%) are males. Another feature of the group receiving the scales is that 32 are (16.2%) junior (third grade) and 165 are (83.8%) senior (fourth grade) students. Aside from that 61 of these prospective teachers (31%) are from social sciences teaching department, 32 are (16.2%) from science teaching department, 33 are (16.8%) from primary education mathematics teaching department, 21 are (10.7%) from class teaching department, 23 are (11.7%) from art teaching department and 27 are (13.7%) from preschool teaching department.

## FINDINGS

The way computer self-efficacy affects scientific research self-efficacy and information literacy is aimed to be

**Table 2.** Confirmatory factor analysis (CFA) results of CSE and ILSE scales.

Scale	$\chi^2$	df	$\chi^2/df$	GFI	CFI	IFI	AGFI	RMSEA	SRMR
ILSE	216.862	113	1.919	0.901	0.919	0.920	0.866	0.065	0.0622
CSE	299.847	113	2.654	0.890	0.917	0.918	0.852	0.078	0.0528



**Figure 1.** Standardized regression analysis results of CSE, SRSE and ILSE scales.

**Table 3.** Fitness index values of the established model.

	$\chi^2$	df	$\chi^2/df$	GFI	CFI	IFI	AGFI	RMSEA	SRMR
Model	92.370	41	2.253	0.922	0.951	0.952	0.875	0.062	0.0558

detected via standardized regression coefficients and obtained findings have been pictured in Figure 1.

As standardized regression (beta) coefficients are examined it surfaces that computer self-efficacy has a positive effect on information literacy self-efficacy ( $\beta = 0.42$ ;  $p = 0.001$ ). In the same way it has been detected that information literacy self-efficacy positively impinges scientific research self-efficacy ( $\beta = 0.54$ ;  $p = 0.001$ ). It has also been detected that computer self-efficacy affects scientific research self-efficacy on level ( $\beta = 0.25$ ;  $p = 0.003$ ). Fitness index values of the established model are as given in Table 3.

As fitness index values of the established model are examined it surfaces that GFI, CFI, IFI values are closer to 1, Rmsea and Smr values are closer to 0. It has also been detected that  $\chi^2/df$  is 2.253.

### DISCUSSION

At the end of this research it has been designated that computer self-efficacy has a positive effect on information literacy self-efficacy. Furthermore it has been unveiled that information literacy self-efficacy positively affects

scientific research self-efficacy as well. The level of effect of self efficacy on scientific research self-efficacy, which constitutes a different dimension of research, has also been explored and a positive effect has been detected.

In the light of all these findings it can reasonably be argued that computer, information literacy and scientific research self-efficacies should be handled collectively in learning processes. There are many researches supporting these findings. In a research conducted by Korkut and Akkoyunlu (2008), a positive relation has been detected between information and computer self-efficacy. Özmusul (2012), quoting from Liao and Chang (2010), has reported that information literacy is affected by computer and internet means, information domains and past experiences of individuals and he also makes reference to technological elements. In another research a meaningful difference has been detected between information literacy levels and computer literacy levels of teachers with respect to the education grades instructors are assigned for teaching (Erdem, 2007). These results are important since they show that computer self-efficacy and information literacy self-efficacy can be analyzed collectively.

Another dimension of this research is designating the relation between information literacy and scientific research self-efficacy. As regards this dimension certain research findings attract attention. Wurman (2001) notes that people with insufficient information literacy skills have missing information and they are contingent upon others to access information and they even demonstrate extremely high levels of information anxiety. Based on this research finding it can be asserted that information literacy is a prerequisite of scientific research skills. A research supporting this finding has been carried out by Heng and Mansor (2010) who accentuated that information literacy education is effective in elevating academic self-efficacy and learning performance of students. Chen (2011) has also reported that information literacy has a positive effect on learner's performance. Salleh et al. (2011), on the other hand, argue that information literacy has no effect on academic performance. It is likely that the most explanatory results on this issue have been obtained by Ketelhut (2006) who detected that students who in the beginning had low self-efficacy gathered fewer scientific data compared to students with high self-efficacy; however in the course of time self-efficacy lost its effect on the skill of gathering scientific data. Bayram and Comek (2009) also investigated the relationship between information literacy and academic success and detected that there is a high level of connection between academic success of prospective teachers and information literacy self-efficacy. Based on all these findings it can be argued that parallel to the advancement of computer skills, information literacy skills of learners shall become further

developed, hence high learner-readiness level which is essential for scientific research skills shall be fulfilled in certain levels. All these findings have enlightened the question concerning the teaching sequence of the curriculum courses that shall strengthen computer, information literacy and scientific research skills.

## Conclusion

To test the fitness of model established in CFA analysis with the data,  $X^2$ ,  $X^2/df$ , CFI, GFI, RMSEA and SRMR are widely employed (Stapleton, 1997). Low  $X^2$  value indicates that model and data are highly compatible (fitted) (Çokluk et al., 2010). Fitness value indicated as  $X^2/df$  expresses division of key square value with degree of freedom; if obtained ratio is below 2 or 3, fitness is in perfect level (Schreiber et al., 2006), if it is below 5, fitness is in medium level (Sümer, 2000). Aside from that there is another fitness index known as goodness of fit (GFI) and it takes value varying between GFI 0.00 and 1. Negative values are theoretically insignificant. As the sampling becomes larger in size GFI provides better consistent results. If GFI takes 0.95 and higher values it indicates perfect fitness of data to the model (Schreiber et al., 2006). Besides if GFI is 0.85 and above, this is accepted to be sufficient for model-data fitness (Sümer, 2000). CFI, on the other hand, compares the present model with absence model which assumes that there is no relation amidst latent variables. CFI takes values changing between 0.00 and 1. For CFI index 0.90 and higher values are values that justify the model. 0.95 and higher values indicate perfect fitness of data (Sümer, 2000). SRMR is average difference amidst observed, latent variables and covariances in the model. Near-zero value or below 0.05 value of RMSEA and SRMR indicate that model-data fitness is perfect (Sümer, 2000). However, it is also noted that values equal to 0.08 or smaller are also acceptable for model-data fitness (Schreiber et al., 2006). For AGFI index, 0.80 and above values are deemed to be satisfactory (Sümer, 2000). As these information provided relevant literature on CFA and CFA results of CSE and ILSE scales are compared it has been detected that scale adaptation processes are fitting. In the same way fitness indexes of established model are also acceptable within the scope of the criteria in literature.

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