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The Role of Computer Self-efficacy, Self-esteem, and Subjective Well-being in Predicting Research Self-efficacy Among Postgraduate Students

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Abstract The aim of this study was to investigate the extent to which postgraduate students' belief in their computer self-efficacy, self-esteem and subjective well-being predicts research self-efficacy. The study group consisted of 247 postgraduate students studying at the Karadeniz Technical University Institute of Social Sciences, Institute of Science and Institute of Health Sciences. The Research Self-Efficacy Scale, Computer Self-Efficacy Scale, Self-Esteem Scale, Subjective Well-being Scale, and a Demographic Data Form were used for data collection. Data analysis was performed by Pearson moments correlation, multiple linear regression analysis, *t* test, one-way analysis of variance, and the Scheffe test. Study findings revealed a significant positive correlation between students' belief in their research self-efficacy and computer self-efficacy and subjective well-being, but no significant correlation with self-esteem. In terms of belief in their research self-efficacy, female students regarded themselves as more efficacious than did males, Institute of Science students regarded themselves as more sufficient than students at the other institutes, and students working on doctorates regarded themselves as more efficacious than master's degree students with or without a thesis component. In addition, findings revealed that belief in research self-efficacy varied depending on the number of scientific congresses attended within the year, number of papers written, subscriptions to scientific journals, and daily length of computer use for scientific purposes. These results showed that computer self-efficacy and subjective well-being are significant predictors of belief in research self-efficacy.

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Introduction

Self-efficacy, one of the basic concepts of social cognitive theory, is defined as an individual's confidence regarding whether or not he/she will be able to perform a particular task (Bandura 1977, 1982, 1989, 1997). While doubts about their abilities have a negative effect on individuals' performance, confidence contributes to better task performance. In addition, an expectation of self-efficacy expectation influences behavior, overcoming difficulties and successful task completion (Bandura 1997). Belief in one's self-efficacy emerges on the basis of positive conditioning toward the individual from others and of psychologic state, associated with present and past performance (Schunk and Pajares 2002). Bandura (1981) states that individuals exhibit reluctance when faced by tasks they think exceed their capacities, but that they are very enterprising when they think a task is one they can successfully perform.

In that regard, belief in self-efficacy may be said to have a positive influence on individuals' motivation and success in and entrepreneurial attitude toward a task. Belief in one's self-sufficiency is not a characteristic that overcomes a lack of computer or other skills. It is an internal factor that enhances individual performance. One can therefore say that it will affect both the performance an individual will display in a task and also the determination of objectives. Individuals with a high belief in their self-efficacy select long-term and upper level objectives that are challenging for them, and the superior performance they display as a result enhances their success (Elias and Loomis 2002; Lane et al. 2004).

Research has shown a significant positive correlation between belief in one's self-efficacy and academic performance, and that students with a high belief in their self-efficacy exhibit more entrepreneurial and enthusiastic behavior on the subject of experimental and scientific research (Lane and Lane 2001; Manstead and van Eekelen 1998; Newby-Fraser and Schlebusch 1997; Pajares 1996; Stajkovic and Luthans 1998; Wood and Locke 1987; Zimmerman et al. 1992). Dimensions influencing scientific research activity and competencies may be summarized as research instruction, personal characteristics and social/cognitive dimensions. Belief in one's research self-sufficiency lies among the social/cognitive dimensions of these (Bard et al. 2000). Research self-sufficiency is defined as an individual's belief as to whether or not he/she will be able to complete a research task, and that belief is reported to affect the individual's research performance, and thus entrepreneurial behavior, continuity, success, and boldness (Bard et al. 2000; Zimmerman 2002).

Research shows that students' belief in their self-efficacy determines their participation in scientific research, their performance when they do participate and the resistance they display in the face of difficulties in such activities (Montcalm 1999; Schunk and Pajares 2002). Similarly, individuals with a high level of belief in their research self-efficacy have been reported to exhibit superior behavior on the subject of conducting research (Bieschke et al. 1996; Kahn and Scott 1997; Phillips and Russell 1994). Computer self-efficacy, which can be regarded as one of the specific dimensions of the concept of self-sufficiency, is defined as an individual's belief in his/her capacity to use a computer (Compeau and Higgins 1995; Ursavaş McIlroy and Şahin 2011). Based on that definition, it may be concluded that computer self-efficacy has a positive effect on individuals' tendencies to engage in computer-related activities. It is of great importance for today's postgraduate students, much of whose academic work is done on computer, to have a high level of belief in their computer abilities. Postgraduate students with high self-efficacy will be better able to benefit from computer and information technologies, and their belief in their self-efficacy with regard to scientific activities will therefore rise. An academic with a high belief in his/her self-efficacy and high computer skills will be respected by his/her peers and thus regard him/herself as worthy of respect. His/her satisfaction level with therefore rise, and his/her self-esteem will also grow (Rosenberg et al. 1989) and he/she will feel better as an individual (Diener 1984, 2000).

The concept of subjective well-being, which concerns and enquires into what makes people happy, is defined as a general evaluation based on individuals' satisfaction with life and positive and negative emotions (Diener 1984). It is a known fact that people have a high level of well-being when they experience feelings that please them, when they engage in activities that interest them, and when they experience events that make them happy, in short, when they are happy with their lives (Diener 2000). It is certain that when a postgraduate student enjoys a high level of well-being, this will increase his/her self-confidence and desire to perform research (Diener 1984, 2000). For that reason, in addition to investigating computer self-efficacy, this study also considered the relationship between research self-efficacy and subjective well-being.

This study also investigated the relationship between self-esteem, another variable thought to be important for postgraduate students, and research self-efficacy, as well as with computer self-efficacy and subjective well-being. Self-esteem, evaluated as a person's respect for and value attached to him/herself (Rosenberg et al. 1989), affects individuals' efforts in task performance and completion of tasks they undertake. Individuals constantly strive to maintain and increase their self-esteem (Tajfel and Turner 1986). A high level of self-esteem is regarded as one of the major indicators of psychologic health (Crocker and Park 2004) and suggests general well-being (DuBois and Flay 2004). People with low self-esteem have been observed to make less effort to succeed in a task and may abandon an assumed task sooner (Ferrari 1994).

Therefore, individuals with high feelings of self-esteem may exhibit more determined and more efficacious behavior in terms of research compared to those with low self-esteem. This study therefore also investigated the relation between self-esteem and computer self-efficacy. To summarize, this study investigated the extent to which belief in their computer self-efficacy, self-respect, and subjective well-being predicted belief in research self-efficacy among postgraduate students at various institutes. It also set out to investigate belief in research self-efficacy in terms of certain demographic variables.

Method

Sampling

The research group consisted of 247 postgraduate students attending the Karadeniz Technical University Institute of Social Sciences (84 students, 34 %), Institute of Science (131 students, 53 %), and Institute of Health Sciences (32 students, 13 %) in the 2009–2010 academic year. Ninety-three (37.7 %) were female and 154 (62.3 %) male. Eighty-two (33.2 %) of the students participating were enrolled in non-thesis master's programs, 83 (33.6 %) in master's programs with a thesis component and 82 (33.2 %) in doctoral programs.

Data Collection and Instruments

The Computer Self-Efficacy Scale, Research Self-Efficacy Scale, Rosenberg Self-Esteem Scale, Subjective Well-being

Scale and a Demographic Data Form were used for data collection.

Research Self-Efficacy Scale

The Research Self-Efficacy Scale was developed by Bieschke et al. (1996) and adapted into Turkish by İpek et al. (2010). The scale consists of 51 items and has four subdimensions, preparation, conceptualization, application, and presentation. The lowest possible score from the scale is 51 and the highest 225. Cronbach alpha values for each subscale are .93, .86, .87, and .92, respectively, with a total value of .96. This study took into account the total scores of the postgraduate students in the study group. High scores indicate a high belief in one's research self-efficacy.

Computer Self-Efficacy Scale

Developed by Gürcan (2005), the Computer Self-Efficacy Scale is used to determine individuals' belief in their computer skills. It consists of 27 items on a 4-point four-point Likert-type scale. The lowest possible score is 27 and the highest 108. The scale has an internal consistency (Cronbach alpha) of .96.

Rosenberg Self-Esteem Scale

The scale was developed by Rosenberg (1965) and adapted into Turkish by Tuğrul (1994) and Çuhadaroğlu (1986). It is a four-point Likert-type scale consisting of 10 items with five positive and five negative statements. Total scoring was used since self-esteem is regarded as a one-dimensional concept (Corwyn 2000). Cronbach alpha value was calculated as the scale reliability indicator and a rather high value (0.85) for a short, 10-item scale was determined. Items 1, 2, 4, 6, and 7 inquire into positive self-evaluation. Scoring ranges from 0 to 3. Items 3, 5, 8, 9, and 10 inquire into negative self-evaluation. Total score range is between 0 and 30. The Cronbach alpha reliability co-efficient reported in the adaptation study is .76 (Çuhadaroğlu 1986). By the test-repeat test method at four-week intervals, a reliability co-efficient of 0.71 was calculated in the adaptation study. The high score obtained from the scale following the conversion of reverse items indicates high self-esteem.

Subjective Well-being Scale

The Subjective Well-being Scale was developed by Tuzgöl-Dost (2005) to determine individuals' subjective well-being levels and consists of 46 items. The scale is a five-point Likert-type scale with 26 positive expression items and 20 negative. The lowest possible score is 46 and the highest 230. High scores indicate a high level of subjective well-being. The scale's Cronbach alpha reliability co-efficient has been calculated at 0.86.

Demographic Data Form

Prepared by the author, the demographic data form was intended to elicit descriptive data such as sampling group gender (female, male), institute attended (Institute of Health Sciences, Institute of Social Sciences, Institute of Science), education program (non-thesis master's degree, master's degree with a thesis, doctorate), and average annual scientific activities; congress participation (not at all, once, twice, more than two), scientific papers written (not at all, once, twice, more than two), annual subscription to relevant journals (not at all, one journal, two journal, more than two journals), number of e-journals read on a regular basis (none, one e-journal, two e-journals, more than two e-journals), and daily computer use for scientific purposes (0–1 h, 1–5 h, more than 5 h).

Procedure and Data Analyses

Scale questionnaires were administered in a class setting by members of staff entering classes and were completed in around 30 min. Before administration of the scales, students were given the requisite information about the aim of the research and how the measurement scales should be answered. The data obtained from the collection procedure were then prepared for the appropriate statistical procedures on computer by SPSS 16.0. Statistical analysis was performed by Pearson moments correlation, multiple linear regression analysis, *t* test, and one-way analysis of variance. Fisher's Least Significant Difference (LSD) test was used to determine which groups the difference stemmed from.

Results

Relations between students' belief in their research self-efficacy and computer self-efficacy, self-esteem and subjective well-being, and findings regarding whether or not belief in research self-efficacy varies according to specific variables, are set out below.

Relationship Between Postgraduate Students' Research Self-efficacy, Computer Self-efficacy, Self-esteem, and Subjective Well-being

The correlation between postgraduate students' research self-efficacy, computer self-efficacy, self-esteem, and subjective well-being levels was tested using Pearson correlation analysis, and the results are given in Table 1. Analysis results

Table 1 Relationships between research self-efficacy, computer self-efficacy, self-esteem, and subjective well-being

	Research self-efficacy	Computer efficacy	Self-esteem	Subjective well-being	Mean	Sd
Research self-efficacy	1	0.52*	0.09	0.29*	177.35	30.49
Computer efficacy		1	0.08	0.23	83.45	13.57
Self-esteem			1	0.48	31.47	5.81
Subjective well-being				1	178.63	24.51

* $p < 0.01$

showed a significant positive correlation between belief in research self-efficacy and computer self-efficacy ($r = 0.52$, $p < 0.01$) and a significant positive correlation with subjective well-being ($r = 0.29$, $p < 0.01$), while no significant correlation was determined between belief in research self-efficacy and self-esteem.

Multiple regression analysis was used to investigate computer self-efficacy, self-esteem, and subjective well-being as predictors of postgraduate students' belief in their research self-efficacy, and the results are given in Table 2. As shown in Table 2, computer self-efficacy and subjective well-being account for 30 % of total research self-efficacy variance ($F_{(3,237)} = 34.72$, $p < 0.05$), and this was significant. However, the contribution to the model of computer self-efficacy ($\beta = .48$, $p < 0.05$) and subjective well-being ($\beta = 0.20$, $p < 0.05$) of self-esteem was not significant.

Postgraduate Students' Belief in Their Research Self-efficacy by Gender

The presence of any significant difference between postgraduate students' belief in their research self-efficacy by gender was analyzed by the t-test, and the results are given in Table 3. As shown in Table 3, female students' belief in their research self-efficacy levels are significantly higher compared to those of male students ($t = 2.21$, $p < 0.05$).

Postgraduate Students' Belief in Their Research Self-efficacy by Institute Attended

One-way analysis of variance was used to determine whether postgraduate students' belief in their research self-efficacy varied according to institute attended and the results are given in Table 4. Table 4 shows that postgraduate students' belief in their research efficacy varies according to the institute attended ($F_{(2,244)} = 7.97, p < 0.05$). According to the results of the LSD test, performed to determine which groups the difference stemmed from, Institute of Science students' research self-efficacy scores were significantly higher compared to those of Social Sciences and Health Sciences institute students. Institute of Social Sciences students' research self-efficacy scores were also significantly higher than those of Institute of Health Sciences students.

Postgraduate Students' Belief in Their Research Self-efficacy by Program Followed

One-way analysis of variance was used to analyze whether postgraduate students' belief in their research self-efficacy varied according to the program followed. The results are shown in Table 5. These revealed a variation in postgraduate students' belief in their research self-efficacy according to education program ($F_{(2,244)} = 25.69, p < 0.05$). According to the results of the LSD test, used to determine from which group the difference stemmed, doctoral students' research self-efficacy scores were significantly higher than those of master's students, with or without a thesis component, and the research self-efficacy scores of master's students with a thesis component were significantly higher than those of non-thesis master's students.

Postgraduate Students' Research Self-efficacy by Participation in Annual Scientific Activities

One-way analysis of variance was used to evaluate differences in postgraduate students' research self-efficacy on the basis of such annual activities as participating in congresses, writing scientific papers, journal subscriptions, and e-journal subscription. The findings are set out in Table 6. Postgraduate students' research self-efficacy varied according to number of congresses attended over the year ($F_{(3,243)} = 12.09$, $p < 0.05$). The Scheffe test was then applied to determine which groups this difference stemmed from. The research self-efficacy scores of students attending one, two, and more congresses a year were significantly higher than those of non-participants.

Postgraduate students' research self-efficacy varied according to the number of scientific papers they wrote over a year ($F_{(3,243)} = 11.46$, $p < 0.05$). The Scheffe test performed to determine which groups that difference stemmed from showed that research self-efficacy scores of students writing one, two, and more than two scientific papers a year were significantly higher than those of students writing no papers. The study also investigated whether postgraduate students' research self-efficacy scores varied in accordance with the number of journals they subscribed to, and again determined a difference ($F_{(3,243)} = 7.42$, $p < 0.05$).

Table 2 Multiple linear regression analysis results regarding research self-efficacy prediction

Variables	*B*	*β*	*t*	*p*	*R*	R^2	ΔR^2	*F*
Fixed	47.27		3.03	0.003	0.55	0.30	0.30	34.72*
Computer efficacy	1.08	0.48	8.61	0.001				
Self-esteem	−0.25	−0.05	−0.77	0.440				
Subjective well-being	−27	0.20	3.30	0.001				

* $p < 0.05$

Table 3 Belief in research self-efficacy by gender

	N	Mean	Sd	*t*	*p*
Female	93	183.15	34.51	2.21	0.03
Male	154	173.84	27.31		

Table 4 Differences in research self-efficacy based on institute attended

	Source	SS	df	MS	*F*	*p*
Research self-efficacy	Between groups	14029.63	2	7014.81	7.97	0.001
	Within group	214652.4	244	879.72		
	Total	228682.1	246			

The Scheffe test was again used to determine the source of that difference, and showed that the research self-efficacy scores of students subscribing to one, two, and more journals were significantly higher compared to those of students with no subscriptions.

Finally, postgraduate students' research self-efficacy scores also differed according to the number of e-journals they read regularly ($F_{(3,243)} = 28.96, p < 0.05$). Scheffe test results showed that the research self-efficacy scores of students reading more than two e-journals were higher than the scores of those reading one or none. Similarly, the research self-efficacy scores of students reading one e-journal were significantly higher than those reading none.

Postgraduate students' Research Self-efficacy According to Daily Length of Computer use For Scientific Purposes

The F test was used to determine whether postgraduate students' research self-efficacy varied according to daily use of computers for scientific purposes. The results are given in Table 7. Students' research self-efficacy scores differed significantly according to length of daily computer use for scientific purposes ($F_{(2,244)} = 29.15, p < 0.05$). The LSD test was used to determine which groups this difference stemmed from. The research self-efficacy scores of students using computers for scientific research for more than 5 h a day were significantly higher than those using computers for scientific purposes for 1–5 h or 0–1 h. Similarly, the research self-efficacy scores of students using computers for 1–5 h a day were significantly higher than those of students using computers for 0–1 h a day for scientific purposes.

Table 5 Differences in research self-efficacy based on program followed

	Source	SS	df	MS	*F*	*p*
Research self-efficacy	Between groups	39774.35	2	19887.18	25.69	0.001
	Within group	188907.7	244	774.21		
	Total	228682.1	246			

Discussion and Conclusions

This study determined a significant positive correlation between belief in one's research self-efficacy and computer self-efficacy and also between subjective well-being. No significant correlation was established between belief in research self-efficacy and self-esteem. This suggests that individuals confident in their ability to use computers effectively and who feel good as individuals have high belief in their research self-efficacy and regard themselves as more skilled at performing scientific research. The lack of any significant correlation between research self-efficacy and self-esteem may be interpreted as meaning that competition in academic life is rather intense, that academic satisfaction is difficult to achieve, and that very different internal and external factors (such as superior disliking a piece of research or comparisons being made) enter the equation (Chang et al. 2012; Chen 2012). Research has shown that postgraduate students with a positive computer attitude regard themselves as more efficacious on the subject of research self-efficacy (İpek et al. 2010). Some studies, however, have shown that individuals with high computer self-efficacy are more willing to participate in computer-related activities and have higher expectations from such activities (Aşkar and Umay 2001).

This study determined that female students had higher levels of belief in their research self-efficacy than males. This shows that in terms of research self-efficacy, female students regard themselves as more efficacious than males. This finding may also be interpreted as meaning that postgraduate education, and therefore academic life, is regarded as attractive by both males and females, but that women are superior in terms of study discipline, productivity, and

Table 6 Differences in research self-efficacy based on annual scientific activities

	Source	SS	df	MS	*F*	*p*
Congress attendance	Between groups	29700.7	3	9900.23	12.09	0.001
	Within group	198981.4	243	818.85		
	Total	228682.1	246			
Writing scientific papers	Between groups	28349.10	3	9449.7	11.46	0.001
	Within group	200333	243	824.41		
	Total	228682.1	246			
Journal subscription	Between groups	19188.88	3	6396.29	7.42	0.001
	Within group	209493.2	243	862.11		
	Total	228682.1	246			
e-journal subscription	Between groups	60225.13	3	20075.04	28.96	0.001
	Within group	168456.9	243	693.24		
	Total	228682.1	246			

Table 7 Differences in research self-efficacy based on daily computer use for scientific purposes

	Source	SS	df	MS	*F*	*p*
Research self-efficacy	Between groups	44106.64	2	22053.32	29.15	0.001
	Within group	184575.4	244	756.46		
	Total	228682.1	246			

self-confidence. However, no studies supporting this finding were found in the literature, while several studies do not support that conclusion. For example, there are studies showing that research self-efficacy perceptions among postgraduate students vary in favor of males to a significant extent (İpek et al. 2010). Studies have also shown that research anxiety scores among postgraduate students do not vary significantly in terms of gender (Bailey 1999; Sam et al. 2005; Saracaloğlu 2008; Trimarco 1997; Schwarzer et al. 1999). In addition to research conclusions emphasizing that male academics regard themselves as more efficacious compared to females (Schunk and Pajares 2002), other studies have also shown self-efficacy and research productivity again vary in favor of males (Vasil 1992).

The fact that belief in research self-efficacy is higher among Institute of Science students compared to those at the Institute of Social Sciences and the Institute of Health Sciences suggests that students in the field entering the laboratory environment with academics in that discipline and having their help in organizing, performing, and bringing to a conclusion experiments regarding their research constitutes an advantage in participating in research. Bearing in mind, however, that Institute of Health Science students have an intensive study tempo in a hospital environment, this finding may be ascribed to their being unable to devote sufficient time to research (Gürcan 2005; İpek et al. 2010). According to the results, doctoral students' research self-efficacy scores are significantly higher than those of both thesis and non-thesis master's student. Similarly, the research self-efficacy scores of with-thesis master's students were significantly higher than those of non-thesis master's students. This finding shows that belief in one's research self-efficacy is correlated with experience and education, and that individuals' self-confidence in terms of performing research rises in line with educational levels. In a study of Australian academics, Bailey (1999) determined a significant, positive correlation between academic degree and scientific research experience and between belief in research self-efficacy and motivation. Bandura (1977) and Schunk and Pajares (2002) also emphasize that previous experience is important among those factors determining research self-efficacy. The high belief in their research self-efficacy among doctoral students thought to participate in more scientific research compared to master's students, is therefore unsurprising.

This study determined significantly higher research self-efficacy scores among students attending one, two, and more congresses a year compared to those attending none. This finding may be interpreted as a greater desire to conduct research among postgraduate students who meet colleagues and engage in scientific exchanges, and that this has a positive impact on their attitudes. Similarly, the research self-efficacy scores of students writing one, two, and more than two papers a year were significantly higher than those of students writing none. This suggests that students seeing their names published in journals increases their self-confidence and desire to engage in research. Previous studies have also reported a significant and positive correlation between belief in self-efficacy and academic performance, and that students with a high belief in their self-efficacy are entrepreneurial in terms of experimental studies and taking part in scientific activities (Bouffard-Bouchard 1990; Lent et al. 1986).

Research self-efficacy scores were significantly higher in students subscribing to one, two, or more journals compared to those with no subscriptions. This shows that keeping up to date with scientific reference sources is important in planning and organizing postgraduate study. Keeping up with studies in one's own field may support students in producing new and original work of their own. Similar to this finding, the research self-efficacy scores of students reading more than two e-journals were significantly higher than those reading one or two e-journals and of those reading none. In the same way, the research self-efficacy scores of those reading one e-journal were significantly higher than those of students reading none. E-journal opportunities for different fields are very broad today when unlimited technological means are available to people working in science. Bearing in mind that individuals with a high belief in their research self-efficacy also use computers in an efficient manner, one might expect them to make use of such opportunities and to enhance their scientific productivity by reading large numbers of e-journals. Study results also show that students using computers for scientific research more than 5 h a day have significantly higher research self-efficacy scores than those using them for scientific research for only 1–5 h or 0–1 h. Similarly, the research self-efficacy scores of students using computers for scientific purposes for 1–5 h a day were significantly higher than those of students using them for 0–1 h a day. This suggests that the more time students spend using computers for scientific purposes, the more studies from their own fields they read and the more they are encouraged to do their own research. However, this finding should be evaluated in the light of studies reporting the disadvantages of using computers or the internet for more than 5 h a day (Odaci and Kalkan 2010; Odaci 2011).

There are various limitations to this study. One is that the research group was made up of students attending postgraduate programs at the Institute of Health Sciences, the Institute of Social Sciences and the Institute of Science. Results can therefore only be compared with research concerning students at the same institutes, and not with research concerning students at the Institute of Educational Sciences. Another limitation is that the study was performed in Turkey, a developing country. This should be borne in mind when comparing the presented study results with those from developed countries. Another limitation is that the study was conducted at the university where the author works. This should be taken into account in evaluating the study findings. Finally, the fact that the study was conducted among postgraduate students at institutions in a public university may also be regarded as a limitation. In evaluating the results of this study it should be borne in mind that results of studies on postgraduate students at private universities may be different.

This study investigated research self-efficacy in the light of specific variables. The inclusion of different demographic variables and individual characteristics in future studies may lead to more enlightening results in revealing situations affecting belief in research self-efficacy. This study on belief in research self-efficacy and correlations with other variable had a cross-sectional design. Future studies might use descriptive and experimental designs. For an academic, research self-efficacy is an indicator of involvement in academic life.

Implications of the Study

This study showed that computer self-efficacy and subjective well-being are significant predictors of belief in one's research self-efficacy. Belief in one's research self-efficacy is correlated with past experience. For that reason, students should be encouraged to do research homework and projects right from primary school. With their desire to improve themselves professionally and become academics, students proceeding to postgraduate education should be given classes aimed at developing their effective computer use and research skills.

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