Development of Research-Like Activities in Everyday Life Measure and Association with Core Self-Evaluation Scale in Thai Undergraduate Students

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Abstract   Urgent needs to increase numbers of researchers in Thailand, especial in social science, humanities, and education, have called for the assessment of potential behaviors. The purpose of this study was to develop and preliminary validate "research-like activities in everyday life" (RAEL) scale using factor analytical approach in students in Thailand. Findings confirm the existence of two factors: 1) predictions for problem solving and 2) finding the causes of sickness for coping, with total of 10 items. High correlation of RAEL and core self-evaluation, research consuming, and self-regulated learning were found. Suggestions for future studies and implications are provided.

Keywords   Core self-evaluation, Research-Like activities, Research consuming, Self-Regulated learning

1. Introduction

Despite of strong effort to increase research productivity of scholars in social science, humanities, and education in Thailand, both quality and quantity of research studies are still substandard. One of the major causes of this problem may be the inadequate numbers of high-quality researchers. There was only one full-time researcher to 10,000 Thai population (Chart Bins, 2010) among the three groups of disciplines mentioned above. Thus, every effort has to be assembled to heighten the research productivity and hence research scholars in Thailand. One way to elevate the achievement of these goals is to carry out research and development programs for producing more Thai researchers. However, many reliable and valid scales and measurements are needed.

Among these measures, the more urgent one is a measure of readiness and potential to become scientific researcher, for use with undergraduate students in the social sciences, humanities, and education. Thus, this research report aims at developing and validating a scale entitled "research-like activity in everyday life" (RAEL). Factor analysis was used for scale development. Multiple regression analysis was used for indicating criterion-related validity of the scores on this scale.

2. Literature Review

2.1. Concept of Research-Like Activities in Everyday Life

Scientific inquiry is normal action of human beings with advanced problem solving abilities. On the other hand, researchers take various steps in their studies namely, being interested in cause-effect relationships, gathering data for use in comparing and/or making associations and being more confidence when adhering to the law of large numbers (Kerlinger & Lee, 2000).

Students who have a habit of using research-like activities in their everyday life will be readier to accept research training. The research activities are consonant with their habit. Habit of an individual has been conceptualized as repeated and automatic behaviors which resulted in satisfaction for the actor. This type of behaviors can be measured as habit strength (Verplanken & Orbell, 2003). The behaviors can be in the forms of problem-solving or prevention of personal harms or accidents, such as mindful-risk-taking behavior (Bhanthumnavin, 2013).

Research-like activity in everyday life can be conceptualized as the combination of two constructs, i.e., habit of an individual and research-like activity. When come together they form research habit which aims at coping, problem-solving and decision-making. Thus, the RAEL measure constructed in this study was based on the above conception.

2.2. Core Self-Evaluation and RAEL

Both human factors and situational stimulations are the antecedents of a person's habit (Verplanken & Orbell, 2003). Human factors in this context were psychological and

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behavioral characteristics of individual, such as, core self-evaluation (CSE), research consuming (RC), and self-regulated learning (SRL).

CSE is a higher-order personality construct, consists of four basic psychological traits, i.e., internal locus of control, self-efficacy, self-esteem, and neuroticism. This measure is popularly used for the respondents to evaluate themselves on their abilities to predict and to control events, as well as, their success and self-satisfaction (Judge, Erez, Bono, & Thoresen, 2003). Some of the traits in CSE were found to relate to coping and problem-solving ability as evidence below.

In another study on 650 Spanish students, two neuroticism scales used were considered to be similar to the neuroticism component in the CSE scale. The neuroticism test was found to be strongly and negatively related to the positive problem-solving and positively related to negative problem-solving. (D'Zurilla, Mayden-Olivares, & Gallardo-Piyol, 2011).

If the RAEL can measure research habit with strong emphasis on problem-focused and problem-solving behaviors, CSE would be a potential correlate of RAEL. Using direct and translated measure of CSE in this study, it is expected that the results would extend the validity of the CSE construct. Thus, it is hypothesized that CSE is one of the important predictors (correlates) of RAEL in this study.

2.3. Research Consuming and RAEL

The preferred exposure to useful research information enables the individuals to increase their knowledge and acceptance of certain new actions (Bandura, 1977). Normally professional consumption of a research report encompassed the scrutinizing of seven characteristics of a research study to evaluate its internal validity (Mayo & LaFrance, 1977). However, laypersons usually go directly to the research results.

Knowledge acquisition and knowledge application are the two important components used in this study as the sub-definitions of research consuming variable. On the other hand, they are considered to be two of the five characteristics of complex problem solvers used in the study of 490 German students from grades 8 to 13. This study showed the important role of knowledge consuming on learning success (Greiff & Neubert, 2014). Since consuming in research results is also a necessary and initial part of research activities (Boote & Bile, 2005), it can be expected that the students who consume more research information, are the ones with higher RAEL scores.

2.4. Self-Regulated Learning and RAEL

Self-regulation of an individual is usually followed from goal orientation and self-directedness. It is the opposite of procrastination (Saks & Leijen, 2014). Research evidence on the significant relationships between self-control and behaviors in various life-tasks are abundant. Four interesting studies are presented as follows.

Ninety freshmen nursing students in South Korea used self-administered questionnaires. It was found that their self-directed learning was positively related to their problem solving ability (Choi, Lindquist, & Song, 2014). In another study with 154 Australian undergraduates, self- regulation of eating behaviors consisted of two components, i.e., temporal orientation measuring consideration of future consequences and impulsivity, or non-delayed response. For the eating behavior of saturated fat, gender and intention to act were entered first. It was found that impulsivity showed greater predictability of fat eating behavior beyond the first two predictors. However, such result was not evident on the analysis of fruit and vegetable eating (Mullan, et al, 2014).

The last study used 305 graduate and postgraduate students who enrolled in the online learning program. It was found that the metacognitive self-regulation scores of these adults were positively related to their self-competence, self-efficacy, and also their cognitive and affective engagement in the course. On the contrary, self-regulation was negatively related to behavior engagement in the course (Pellas, 2014).

These studies concertedly demonstrated the role of self-regulation in predicting various types of important behaviors. Thus, it can be hypothesized that self-regulated learning shows positive relationship with RAEL scores in the present study. Furthermore, it is expected that the RAEL measure can be validated by the use of three important predictors, namely, core self-evaluation (CSE), research consuming (RC), and self-regulated learning (SRL). Together, they are expected to account for at least 40% of the variance of the RAEL (research-like activities in everyday life) variable by performing Multiple Regression Analysis.

3. Research Hypotheses

There are three hypotheses in this study.

Hypothesis 1: By performing exploratory factor analysis, RAEL measure is composed of at least 2factors with at least two items and the total of no less than 10 items, with the cumulative percentage of at least 60%.

Hypothesis 2: By performing confirmatory factor analysis, the underlyinglatent constructs emerging from the EFA for RAEL measure is confirmed by another set of data.

Hypothesis 3: The relationships between other variables and the RAEL can be hypothesized as follows.

Hypothesis 3.1 The relationship between RAEL and RC is positively higher than the relationships between RAEL and CSE or SRL.

Hypothesis 3.2 CSE, RC, and SRL are important predictors of RAEL and can account for at least 50% of the variance.

4. Research Method

4.1. Samples

The sample of this study consisted of 804 undergraduate

students in junior and senior levels from Thai universities in Bangkok, Northern provinces and Southern provinces. The sample was divided into three groups. The first group of 104 students was used for item quality analysis, consisted of 16 males (15.41%) and 88 females (84.60%) with the average age of 21.17 years (SD = 0.03). The second group of 400 students was used for Exploratory Factor Analysis (EFA), consisted of 112 males (28.30%) and 284 females (71.70%) with the average age of 21.02 years (SD = 0.91). The third group of 300 students was used for Confirmatory Factor Analysis (CFA) and validation, consisted of 74 males (24.70%) and 225 females (75.30%) with the average age of 21.47 years (SD = 0.96). These students were social science, humanity, or education majors.

4.2. Measures

Research-like activities in everyday life (RAEL) was initially defined as having four components but the EFA and CFA yielded two factors. The RAEL measure is the major variable in this research study which was constructed and validated. The details are reported in the result section.

Core self-evaluation (CSE).The original 12 items of CSE measure (Judge, et al, 2003) were translated into Thai, accompanied with 6 unit rating scale from "very true" to "not true at all". The reliability of this measure is found to be 0.74.

Research consuming (RC) is a group of behaviors, consisted of three factors analytic components, namely, interest in receiving research information via social media in everyday life, exposure to and use of research news, and following the recommendations. Thirteen items, each was attached by 6-unit rating scale, ranged from "very true" to

"not true at all". The reliability is 0.83.

Self-regulated learning (SRL) consisted of three factor-analytic components, i.e., self-directed learning, setting subgoals for learning success and creating facilitating situations for success in learning. The final measure consisted of 10 negative items with 6-unit rating scale, ranged from "very true" to "not true at all". The alpha reliability is. 0.70.

4.3. Data Analysis

Item discrimination and item-total correlation were computed to indicate item quality using the data from the first group. The qualified items from this step were employed for EFA in order to reduce number of items and to identify the emerged factors using the data from the second group. The three criteria for EFA were as follows: 1) the Kaiser-Meyer-Olkin test as a measure of sampling adequacy should be greater than 0.60, 2) the Bartlett test of sphericity should be significant, and 3) the total cumulative percentage of all components explaining each measure should be more than 60%. Data from the third group were used to confirm the factors of the construct using second order confirmatory factor analysis technique. The five most commonly used indices for CFA are non-significant chi-square value (Jöreskog & Sörbom, 1996), a root mean square error of approximation (RMSEA) value of less than 0.50 (Browne & Cudeck, 1993), a comparative t index (CFI) of at least 0.90 (Bentler,1990), Tucker-Lewis Index (TLI) of at least 0.95 (Tucker & Lewis, 1973),a standardized root mean square residual (SRMR) of less than 0.80 (Hu & Bentler, 1998).

Table 1. Results of EFA for RAEL measure

		items	Factor loading	
			Factor 1	Factor 2
1	ur8	Eventhough, I often have physical problems such as headache, stomach ache, but I do not pay attention to them (-)	0.84	
2	ur9	I try to consider about the causes of my not being at a place on time (+)	0.83	
3	ur20	I have heard about bad service of a repair center for mobile phone, but I will not belief until experience it myself. (+)	0.81	
4	ur23	I like to find information from many sources in order to confirm the one I had. (+)	0.80	
5	ur6	Before I make any decisions, I usually spend time finding information about it. (+)	0.79	
6	ur15	When I had trouble with my mobile phone, I tried many ways to find its causes. (+)	0.79	
7	ur14	I often feel sick, but I do not try to find the causes. (-)		0.84
8	ur11	I often get a cold, but I do not care tofind the causes of my symptoms. (-)		0.83
9	ur7	I had a strong case of diarrhea, but I never tried to find out what I hadeaten. (-)		0.69
10	ur22	When I got information with questionable reliability, I never try to check with people around me. (-)		0.61
		Eigenvalue	5.45	1.38
		% of Variance	54.52	13.83
		Cumulative %	54.52	68.35

Note: (+) item in positive direction; (-) item in negative direction and must be recoded.

5. Research Results

5.1. Items Quality

In order to pinpoint qualified items of RAEL measure, two statistical analyses were performed using data of 104 undergraduate students: 1) item discrimination (t-ratio) to examined the difference between the mean scores of the lower and upper groups (30% of total respondents for each group), and 2) the item-total correlation coefficient (r) reflected the relationship between the item scores and the total test scores. The significant results revealed that only 18 out of 24 items were qualified (item no. 3, 4, 5, 13, 17 and 19 were excluded).

5.2. Exploratory Factor Analysis of RAEL

Second group of data with 400 undergraduate students was used in further step with EFA technique. Based on 18 selected items from the previous step, the EFA results showed an adequate fit of Kaiser-Meyer-Olkin test (KMO = 0.91) with a significant Bartlett test of sphericity (χ^2 = 2337.76, df = 45, p<.000, N = 400). The results indicated two-factor model of RAEL measure (Table 1). Factor 1 with the eigenvalue of 5.45 was labelled as "Predictions for problem solving". This factor includes 6 items which account for 54.52% of the variance of the RAEL construct.

The second factor consisted of 4 items with the eigenvalue of 1.38 which was labelled as "Finding the causes of sickness for coping". This factor with 4 items could additionally explanation the variance of REAL measure with 13.83%, which led to the total cumulative variance explanation of 68.35% of this construct. Thus, these results supported hypothesis 1.
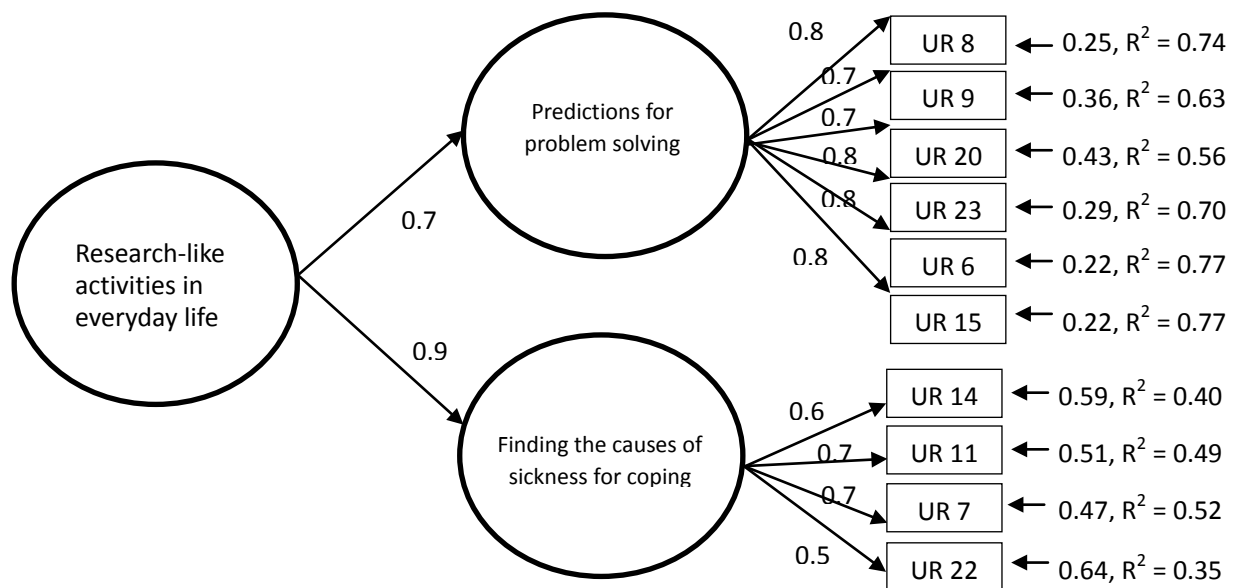
5.3. Second-Order Factor Analysis of RAEL Measure

The results of a second-order factor analysis indicated a model fit with a chi-square value of 41.23 (df = 33, p value = 0.15), RMSEA = 0.029, CFI = 0.99, TLI = 0.99, SMRS = 0.02, which supported hypothesis 2. (Fig. 1). The highest gamma value of 0.92 belong to the factor "Finding the causes of sickness for coping". The highest standardized solution (SS) in this factor was found in item 7 (I had a strong case of diarrhea, but I never try to find out what I had eaten.) with the value of 0.72, followed by item 11 (SS of 0.70: I often get a cold, but I do not care to find the causes of my symptoms), item 14 (SS of 0.64:   I often feel sick, but I do not try to find their causes).

The second factor of RAEL measure was "Predictions for problem solving" with the gamma value of 0.75. The highest standardized solution (SS) in this factor was found in item 15 (When I had trouble with my mobile phone, I tried many ways to find its causes) with the value of 0.88, followed by item 6 (SS of 0.87: Before I make any decisions, I usually spend time finding information about it).

5.4. Reliability and Validation of RAEL Measure

Criterion-related validity of RAEL measure was tested. From Table 2, it was found that RAEL and RC is positively related (r = 0.82, p<.01) with higher degree, while the amount of relationships between RAEL and SRL and CSE were lower (r = .57, p<.01 and r = .59, p<.01, respectively). Thus, hypothesis 3.1 was supported.

(χ^2 = 41.23, p value = 0.15, df = 33, RMSEA = 0.02, CFI = 0.99, TLI = 0.99, SRMR = 0.02, n = 300)

Figure 1.   Second-order factor analysis of Research-like activity in everyday life scale in Thai undergraduate students

Multiple regression analysis was computed. Results in Table 3 indicated that RC, SRL, and CSE accounted for the variance of RAEL with 77.2% accuracy. The first important predictor was RC, followed by CSE and SRL. Thus, hypothesis 3.2 was supported. Reliability of the total score of RAEL was 0.91 with mean of 35.44 and SD of 11.27.

Table 2. Correlation coefficient among variables using RC, CSE, and SRL as predictors

	Variables	Mean	SD	1	2	3
1	RC	46.84	10.94	1		
2	RAEL	35.44	11.28	.82**	1	
3	SRL	35.9	7.30	.57**	.57**	1
4	CSE	43.10	8.93	.59**	.67**	.18**

Note: * $p < .05$, ** $p < .01$

Table 3. Multiple regression analysis on RAEL

Variables	B	Std. Error	Beta	t	Sig.
(Constant)	-19.51	2.02		-9.65	0.00
RC	0.52	0.04	0.5	11.71	0.00
CSE	0.43	0.05	0.34	9.51	0.00
SRL	0.35	0.05	0.22	6.43	0.00

$R^2 = 0.772$; Adjusted $R^2 = 0.769$

6. Conclusions and Discussion

The RAEL 10-item measure was developed by factor analytic technique from the original 24 items. In comparison with the initial definition which consisted of 4 components. The first factor analyzed component have items which scattered among the four original sub-definitions, namely, problem-recognition, making cause-effect prediction, gathering information to test the prediction and making conclusion from many data sources. The second factor-analyzed component covers the two sub-definitions of making prediction and using many data sources for making conclusion. Thus, the scientific behavior as well as problem-solving behavior was presented in the RAEL measure.

In validating the RAEL scale, the strongest positive relationship was with the RC variable (Table 3; r = 0.82, p <.01). This result was consonant with the assertion that consumer behavior can reflect many fundamental motives, one of them is avoiding disease (Griskevicius & Keurick, 2013). Hypothesis 3.1 was confirmed by the results that the correlation between RAEL and RC (r = 0.82) was higher than the relationship between RAEL and CSE (r = 0.67) and also RAEL and SRL (r = 0.57).

Z-test was performed from correlation coefficient in Table 3 and Fig. 2. The Z_H test for dependent correlations (N = 300) were 5.06 (p<.001) and 4.99 (p< .001) which indicated the acceptable differences that the correlation between RAEL and RC was greater than the two others. However, the correlation between RAEL and CSE was also higher than

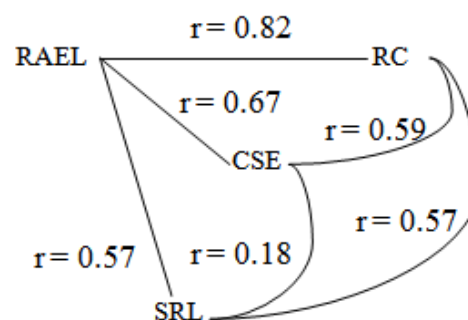that between RAEL and SRL ($Z_H = 2.00$, p =0.45).

Figure 2. Correlation coefficients among variables used in Z-test

The strong relationship between RAEL and RC can be expected for two reasons. First, the two variables were behavioral in nature. Secondly, the RC can be conceptualized as part of the RAEL variable. A group of researchers found that the two sub-definitions of RC (knowledge acquisition and knowledge application) best described the model of the complex problem solving variable in the study of German adolescents students (Griff & Newbert, 2014).

Furthermore, criterion-related validity of RAEL measure was also demonstrated by the technique of multiple regression analysis. The three predictors together can account for 77.2% of the variance in RAEL variable (Table 3). The CSE was second as important predictor of RAEL ($\beta = 0.34$) which means that if one increases the value of CSE by one SD (8.93 points in this study) the value of RAEL will increase by about one third of its SD value (11.28 points here which comes out as 3.76 points of RAEL).

In this study, the CSE played a more important role on the RAEL scores of the Thai undergraduates than the SRL (as evident by the comparisons of correlations and the predictive rank of the CSE and the SRL in Table 3). The result is rather unexpected since the CSE is purely psychological traits while the SRL is a mixture of trait and skills in learning. However, CSE has a wider domain than that of SRL. Thus, the CSE can be more compatible with the domain of RAEL in the present study.

In addition, in this study, it was found that CSE and SRL were complementing each other in predicting RAEL. This result indicates that SRL is another trait which can increase trait-prediction of RAEL. Their complementing roles indicate that these 5 traits are important for predicting the behaviors in RAEL variable. In many studies, CSE has been found to predict some important behaviors or their outcomes (e.g., well-being, good health) beyond other psychological traits such as fluid intelligence and Big 5 personality traits on decision making of high school students (Di Fabio & P., 2012), and cognitive ability on academic achievement of American undergraduates (Rosopa & Schroeder, 2009). Thus, the CSE variable should be used in further studies of research-behavior enhancement.

REFERENCES

[1]   Bandura, A. (1977). *Social Learning Theory*. Englewood Cliffs, NJ: Prentice Hall.

[2]   Bentler, P.M. (1990). Comparative fit indexes in structural model. *Psychological Bulletin*, 107, 238-246.

[3]   Bhanthumnavin, D. E. (2013). *Antecedents and consequences of mindful risk-taking behaviors in secondary school students*. Research report, National Research Council of Thailand.

[4]   Boote, D., & Bile, P. (2005). Scholars before researchers: On the centrality of the dissertation literature review in research preparation. *Educational Research*, 34(6), 3-15.

[5]   Browne, M.W., & Cudeck, K. (1993). *Alternative ways of assessing model fit,* In K.A. Bollen & J.S. Long (Eds.), Testing structural equation models. Newsbury Park (pp. 136-162), CA: Sage Publication.

[6]   Chart Bins. "*Number of researchers per million inhabitants by country.*" Available at http://chartsbin.com/view/1124, 2010.

[7]   Choi, E., Lindquist, R., & Song, Y. (2014).Effect of problem-based learning vs. traditional lecture on Korean nursing students' critical thinking, problem-solving and self-directed learning. *Nurse Education Today*, 34, 52-56.

[8]   D'Zurilla, T.J., Maydeu-Olivares, A., & Gallardo-Pujol, D. (1977). Predicting social problem solving using personality traits. *Personality and Individual Differences,* 50, pp. 142-147, 2011.

[9]   Di Fabio, A., & Palazzeschi. L. (2012). Incremental variation of the core self-evaluation construct compared to fluid intelligence and personality traits in aspects of decision-making. *Personality and Individual Differences*, 53, 196-201.

[10] Greiff, S., & Neubert, J.C. (2014). On the relation of complex problem solving, personality, fluid intelligence, and academic achievement. *Learning and Individual Differences,* 36, 37-48.

[11] Griskevicius, V., & Keurick, D.T. (2013). Fundamental motives: How evolutionary needs influence consumer behavior. *Journal of Consulting Psychology*, 23(3), 372-386.

[12] Hu, L., & Bentler, P.M. (1998). Fit indices in covariance structure modeling: Sensitivity to underparameterized model misspecification. *Psychological Methods*, 3424–453.

[13] Jöreskog, K.G., & Sörbom, D. (1996). *LISREL 8: User's reference guide.* Chicago: Scientific Software, Inc.

[14] Judge, T.A., Erez, A., Bono, J.E., & Thoresen, C.J. (2013). The Core Self-Evaluations Scale (CSES): Development of a measure". *Personality Psychology,* 56, 303–331.

[15] Kerlinger, F. N., & Lee, H. B. (2000). *Foundations of behavioral research* (4th ed.) pp. 4-6, 264-265. Holt, New York: Harcourt College Publishers.

[16] Mayo, C., & LaFrance, M. (1977). *Evaluating research in social psychology: A guide for the consumer.* California Books, Cole Publishing Company.

[17] Mullan, B., Allom, V., Brogan, A., Kothe, E., & Todd, J. (2014). Self-regulation and the intention behavior gap. Exploring dietary behaviours in university students. *Appetite*, 73, 7-14.

[18] Pellas, N. (2014). The influence of computer self-efficacy, metacognitive self-regulation and self-esteem on student engagement in online learning programs: Evidence from the virtual world of Second life. *Computer in Human Behavior,* 35, 157-170.

[19] Rosopa, P.J., & Schroeder, A.N. (2009). Core self-evaluations interact with cognitive ability to predict academic achievement. *Personality and Individual Differences,* 47, 1003-1006.

[20] Saks, K., & Leijen, Ä. (2014). Distinguishing self-directed and self-regulated Learning and measuring them in the e-learning context. *Procedia. – Socialand Behavioral Science,* 112, 190-198.

[21] Tucker, L.R., & Lewis, C. (1973). A reliability coefficient for maximum likelihood analysis. *Psychometrika*, 38, 1-10.

[22] Verplanken, B., & Orbell, S. (2003). Reflection on past behavior: A self-report index of habit strength. *Journal of Applied Social Psychology,* 33(6), 131-1330.