

Instructions for authors, subscriptions and further details:

<http://rise.hipatiapress.com>

Research Self-Efficacy of Cambodian Undergraduate Students at Province-Based Universities

Cheyvuth Seng¹

May Kristine Jonson Carlon¹

Jeffrey Scott Cross¹

1) Tokyo Institute of Technology, Japan

Date of publication: June 25th, 2020

Edition period: June 2020-October 2020

To cite this article: Seng, S., Carlon, M.K.J. & Cross, J.S. (2020). Research Self-Efficacy of Cambodian Undergraduate Students at Province-Based Universities, *International Journal of Sociology of Education*, 9(2), 154-190.
doi: [10.17583/rise.2020.4267](https://doi.org/10.17583/rise.2020.4267)

To link this article: <http://dx.doi.org/10.17583/rise.2020.4267>

PLEASE SCROLL DOWN FOR ARTICLE

The terms and conditions of use are related to the Open Journal System and to [Creative Commons Attribution License](#) (CC-B)

Research Self-Efficacy of Cambodian Undergraduate Students at Province-Based Universities

Cheyvuth Seng
Tokyo Institute of Technology
Jeffrey Scott Cross
Tokyo Institute of Technology

May Kristine Jonson Carlon
Tokyo Institute of Technology

(Received: 18 October 2019; Accepted: 27 February 2020; Published: 25 June 2020)

Abstract

Self-efficacy is crucial for producing challenging research results, which in turn may lead to innovations and development that can accelerate a country's economy. Undergraduate research self-efficacy in Cambodia has been of particular interest because graduates form the future pipeline of research professionals, which is essential for the development of Cambodia. The research self-efficacy of province-based university students, whose numbers have increased in recent years, remains uncertain and needs to be investigated. In this study, we addressed the Research Self-Efficacy Survey by Phillips and Russell (1994) and administered to 1,009 undergraduate students from different faculties at three public province-based universities in Cambodia in order to assess their research self-efficacy. Using t tests and ANOVA, the mean research self-efficacy score was 2.13 ($\pm .66$) on a 5 point-scale and varied significantly with small effect size upon gender, academic year, and working experience. There is a need to focus on interventions aimed at improving the research self-efficacy of undergraduate students. This investigation also included measures and discussions such as curriculum reform, quality of teaching, teacher training, and improving educational materials and research facilities.

Keywords: research self-efficacy, undergraduate research, Cambodia university, graduate attributes, research attitudes

Autoeficacia en Investigación en Estudiantes de Licenciatura de Universidades Provinciales de Camboya

Cheyvuth Seng

Tokyo Institute of Technology

Jeffrey Scott Cross

Tokyo Institute of Technology

May Kristine Jonson Carlon

Tokyo Institute of Technology

(Recibido: 18 Octubre 2019; Aceptado: 27 Febrero 2020; Publicado: 25 Junio 2020)

Resumen

La autoeficacia es crucial para producir resultados competitivos de investigación, que eventualmente podrían llevar a innovación y desarrollo que acelera la economía de un país. La autoeficacia en investigación en estudiantes de licenciatura en Camboya ha sido de particular interés debido a que los estudiantes se transforman en investigadores profesionales, lo cual es esencial para el desarrollo de Camboya. La autoeficacia en investigación de estudiantes de universidades provinciales, cuyos números han incrementado en años recientes, permanece desconocida y debe ser investigada. En esta investigación, citamos el estudio en autoeficacia en investigación de Phillips y Russell (1994) y lo administramos a 1009 estudiantes de licenciatura de diferentes facultades en tres universidades provinciales de Camboya, con el fin de evaluar su autoeficacia en investigación. Usando prueba t y ANOVA, valor promedio de autoeficacia en investigación fue 2.13 (± 0.66) en una escala de 5 puntos y vario significativamente con respecto a género, año académico y experiencia laboral. Es necesario concentrarse en los estímulos enfocados a mejorar la autoeficacia en investigación de estudiantes de licenciatura. Esta investigación también incluye medidas y discusiones respecto a reforma curricular, calidad de enseñanza, entrenamiento de profesores y mejora de los materiales de enseñanza.

Palabras clave: socialización, aprendizaje informal, educación familiar, relaciones intergeneracionales

Engaging in research activity can help university students develop life-long skills for employment, and in some cases, is a requirement to graduate from a university or Higher Education Institution (HEI) particularly in Southeast and Northeast Asia. Research is a term used to refer to any kind of investigation intended to uncover interesting or generate new knowledge (Walliman, 2011). It is also the process of collecting, analyzing, and interpreting data in order to understand a phenomenon (Leedy & Ormrod, 2001). Individuals with research capacity are able to find appropriate solutions to difficult problems and communicate the results by developing a mindset based upon utilizing a scientific approach (Papanastasiou, 2005). Research capable people are essential in determining a country's capacity to innovate (OECD, 2013). The need for researchers can potentially be filled by university graduates, with the number of those coming from the provinces steadily increasing with population growth. For example, HEIs in Cambodia have skyrocketed from 8 in 1997 to 121 in 2018 and enrollments increased from around 10,000 per annum to 219,609 in the academic year 2015 – 2016 (Un & Sok, 2018). A recent report by the ministry of education (Ministry of Education, Youth and Sport [MoEYS], 2017) revealed that there are 121 HEIs in Cambodia: consisting of 43 province-based and 78 city-based institutions. At the very least, these students should be able to develop research self-efficacy or belief in their ability to do research. Self-efficacy can determine an individual's ability to cope when faced with obstacles and sustain long term efforts to resolve important problems (Bandura, 1982).

The Cambodian higher education sector has experienced a resurgence after the civil war (lasting from 1975 until 1979). However, there were no established official policies related to research capacity development within a 30-year (1979 to 2009) period since HEIs were re-established. Cambodian HEIs need to increase their human capital with highly qualified, experienced, and professionally skilled personnel to meet the minimum standards for quality education (Sam et al., 2012) as well as to develop its economy.

The majority of universities in Cambodia are located in the capital city, Phnom Penh. Typically, talented youth in the provinces travel to the capital for higher education and frequently find employment there after graduation, thus not returning to the provinces. To revitalize areas outside the capital city, educational policymakers then conceptualized the “one province one

university” model. Since some of the province-based universities are just getting started, they have to develop quickly to reach the level of their city counterparts. It was reported that faculty members at city-based universities have significantly higher research experience than their province-based counterparts (Eam, 2017).

Similar research on undergraduate research self-efficacy has been done in the past. For instance, a study conducted on Computer Science students in the United States found that having an undergraduate research experience increased students’ confidence and raised students’ awareness of graduate education (Reisel et al., 2015). These studies indicate that providing students with research experience can increase their research self-efficacy. But to be able to actually conduct research, students must first have a good understanding of research methodology, which can be introduced to them through a research methods course. Understanding research methodology can boost students’ research interests (Sizemore & Lewandowski, 2009). A research method course is also beneficial to students interested in entering graduate school: it can be an important component in restructuring the graduate program to be more oriented towards research and solving problems (Shaffer, 2006).

Private and public universities report their research activities to the MoEYS, which in turn controls the quality of the said activities by conducting spot-checks and examination, and giving recommendations when needed. Each university is independent in designing their curricula, environment, infrastructure, laboratory, and facilities to meet their own quality standards. A recent study revealed that the Cambodian higher education is still poorly developed when compared to several other Southeast Asian countries (Ngoy et al., 2019). This is a concern considering the rapid increase in the number.

Purposes of Study

The purposes of this study are to (1) to determine whether there are significant differences in the research self-efficacy of Cambodian undergraduate students in the provinces in terms of their gender, academic year, working experience, faculty (department), and university, and (2) to examine how Cambodia’s undergraduate students in three province-based universities rate their level of research self-efficacy. To achieve these purposes, this study was designed to

measure the undergraduate students' belief in their ability to do research using a descriptive survey and propose interventions to improve student research self-efficacy.

Literature Review

Self-efficacy refers to one's belief in their own abilities (Bandura, 1982); as such, it is a personal attribute that can be affected by personal factors such as gender, age, prior training, and available resources among others. Thus, to be able to better understand self-efficacy, or more specifically research self-efficacy in our case, it is important to analyze it across various personal factors.

One commonly observed personal factor in most research is gender. Several prior research studies have shown that there is a significant difference in research self-efficacy across genders (Oguan et al., 2014; Williams & Coles, 2003). Another factor that is worthy of investigation when it comes to competency research such as self-efficacy is working experience since it can provide additional external resources (e.g. job autonomy and on-the-job-training experience). These additional resources can be mobilized by an individual to their advantage, hence those with work experience have the added benefit of a positive feedback loop (Prieto, 2009).

Given that we are investigating student research self-efficacy, it is also important to account for their academic environments. Previously investigated factors include the student's academic year; a study carried out in Sri Lanka revealed that there is high mean value in the research self-efficacy of fourth-year students compared to other years (Sachitra & Bandara, 2017). It is important to note that the bachelor's program curricula in our selected universities were designed with the principles of research being offered as a three-credit course (45 hours) during the first semester of the fourth-year¹. As such, it can be expected that fourth year students would have higher self-efficacy than third-year students. This could essentially offer us an insight into the effectiveness of a single course on research offered to fourth-year students in these universities.

Additionally, the differences across various fields of study can result in significant differences in research self-efficacy (Sara! & Reyhanlioğlu, 2015). On a slightly larger scale, significant differences among undergraduate

students in terms of research self-efficacy scores depending upon the universities they attended was previously observed (Saral & Reyhanlioğlu, 2015). Similar results were also found in the abilities of postgraduates (Tiyuri et al., 2018). Most relevant to our purpose is the result of a similar study previously conducted in Cambodia that found that the level of involvement in research activities was significantly lower among faculty in province-based universities (Eam, 2015b). The faculty members could have a significant effect on the outcome we are investigating; it was found that if faculty members had low research self-efficacy, this will be transferred to their undergraduate students (Eam, 2015b). Another significant study by (Eam, 2017) also showed that the competency of faculty members from city-based universities was much higher than that from province-based universities. Therefore, the faculty members are also a major factor to define the research ability of Cambodian universities.

The most frequently used measure of research self-efficacy from a psychometric perspective is Self-Efficacy in Research Measure (SERM) (Phillips & Russell, 1994). The original SERM is a 33-item scale comprised of four sub-scales (Practical Research Skills, Quantitative and Computer Skills, Research Design Skills, and Writing Skills) and has achieved good internal consistency when used in a study involving graduate students in counseling psychology.

The original research using SERM showed a positive relationship between research self-efficacy and institutional research training environment as well as research self-efficacy and other personal variables (Phillips & Russell, 1994). The institutional research training environment can be attributed to the opportunities being provided by universities to their faculty members and students, including research subjects included in their curricula. Thus, the effectiveness of the training and the curricula provided to students by faculty and the university in promoting research self-efficacy is an important factor to examine in detail.

Methodology of Research

Research Participants

The sample size of the study was taken from the population of undergraduate students in three public universities located in three different provinces in Cambodia. The participants who were chosen to take part in this study were students enrolled in the academic year 2018-2019. The sample size consisted of 1,009 participants who volunteered to complete the questionnaire completely. The distribution of participants according to their academic year level in their respective program showed that 47.9% were third-year students while 52.1% were fourth-year students. They were comprised of 43.5% males and 56.5% females, with the mean age reported by the participants of 23.3 years ($SD = 4.3$). Participants were from different faculties across their universities.

Sampling and Data Collection

The questionnaires were printed and distributed to all participants. The respondents were given 25 minutes to complete the questionnaires. The total period of data collection from the three universities lasted for one month (from February 22, 2018 to March 22, 2018). The first author instructed the respondents to answer each item in the questionnaire as accurately as they can in Khmer, the local language. Some respondents were not able to complete the survey due to time constraints or decided not to provide the information. This resulted in about 30 percent of all questionnaires distributed being incomplete, so these were omitted from further analysis. See Table 1 below for the detailed demographics of participants in the study.

Table 1.

Demographic data of participants in the study and summary of results

Variables	Level/Items (Measurement)	f (%)	Mean	SD
Gender	0 = Male	439 (43.5)		
	1 = Female	570 (56.5)		
Working Experience	0 = Having experience	575 (57.0)		
	1 = No experience	434 (43.0)		
Faculty	1 = Science and Technology	183 (18.1)		
	2 = Business Administration and Tourism	276 (27.4)		
	3 = Agriculture and Food Processing	209 (20.7)		
	4 = Art, Humanities and Social Sciences	208 (20.6)		
	5 = Institute of Foreign Language	133 (13.2)		
University	1 = University A	415 (41.1)		
	2 = University B	282 (28.0)		
	3 = University C	312 (30.9)		
Academic Year	0 = Year IV	526 (52.1)		
	1 = Year III	483 (47.9)		
Research Self-Efficacy	31 items; 1-5 Likert scale	1,009	2.13	.66

Note: SD = Standard Deviation; f (%) = Frequency (percentage).

Variables

The respondents' demographic variables consisted of the following:

- Gender – which we classify as either Male (0) or Female (1);
- Working Experience – whether the respondents have any prior research experience or not (0 = Have experience; 1 = No experience);
- Faculty – which covers five major disciplines (1 = Science and Technology; 2 = Business Administration and Tourism; 3 = Agriculture and Food Processing; 4 = Arts, Humanities and Social Sciences and 5 = Institute of Foreign Language);
- The academic year the respondents are in at the time the research – this was coded 0 for Year 3 and 1 for Year 4.

- Research self-efficacy, as used in this study, refers to the undergraduate students' research confidence or belief in their ability to do research: that they can obtain research knowledge and skills or can effectively accomplish research and research-related tasks.

The researcher extended and rephrased some items in the SERM to have the same meaning when translated to the Cambodian language (Khmer). Each translated item is fully understood within the context of a Cambodian researcher. Two items from the original survey were merged together since the words “dissertation” and “thesis” has the same meaning in the Cambodian language: “Writing the method and results in sections of a dissertation” and “Writing the method and results in sections of a thesis”, and the last items “Writing the introduction and literature review for a thesis” and “Writing the introduction and literature review for a dissertation”.

Data Analysis

Different statistical methods were used to analyze the data. The researcher used the Statistical Package for the Social Sciences (SPSS) version 21 software to calculate the descriptive statistics, conduct principal component analysis (PCA), and execute independent sample t-test (t-test) and analysis of variance (ANOVA). The first research objective aimed to study the trends of the level of research self-efficacy. Descriptive statistics (i.e. frequency, percentage, mean and standard deviation) were used to show the level of research self-efficacy. The first research objective aimed to investigate if the respondents from the three province-based universities differ in their research self-efficacy according to their gender, year, working experience, faculty, and university variables. The frequencies and percentages were used to calculate the variables to test if there were significant differences in the level of their research self-efficacy. The t-test and ANOVA were used to test the significance of the differences.

Prior to the analysis, the data was evaluated to see if it met the assumptions of the aforementioned statistical methods, and it was concluded that those methods of analysis could be used with confidence. The internal consistency statistics (Cronbach's Alpha) was used to measure how items in each group were internally related to each of the respective constructs. We classified the 31-items into the four groups of constructs to identify the trends of research

activities relating to the respondents’ research self-efficacy and tested them using PCA (see Table 2 below) to examine its construct validity. The same items as in the original SERM were used for factor loading in group-specific and multigroup extraction: 1 = practical research skills, 2 = writing a paper for a journal publication, 3 = quantitative and computer skills, and 4 = research design skills. The factor analysis of each individual step revealed one factor per item. This was determined using only factors with eigenvalues greater than 1. The four factors altogether resulted in 70.18% of the total explained variance (EV). Of those four factors, all subscales were conceptually meaningful and associated with reliable data with alpha values ranging from .92 to .94. Cronbach’s alpha internal consistency reliability index was generated for the data from the set of items related to each factor. The Cronbach’s alpha in the current sample total score was alpha =.97, suggesting good internal consistency.

Table 2.

Principal Component Analysis and Factor Loading of the Research Self-Efficacy and Cronbach’s alpha (n=1009)

Questionnaire Item	Component				Eigenvalue	EV	Cronbach’s alpha
	1	2	3	4			
Making time for research	.79						
Understanding how to seek help	.74						
Contacting researchers currently working in an area of research interest	.74						
Keeping records during a research project	.72				17.58	18.56%	.93
Collecting Data	.70						
Gathering an adequate number of participants for a research study	.64						
Getting money or funding to help pay for research	.58						
Defending a thesis or dissertation	.56						
Writing the introduction and literature review for a thesis	.74				1.97	17.69%	.94

Table 2. (continue)

Questionnaire Item	Component				Eigenvalue	EV	Cronbach's alpha
	1	2	3	4			
Writing the introduction and discussion sections for a research paper for publication		.72					
Writing a discussion section for a thesis or dissertation		.73					
Writing the method and results sections of a dissertation and thesis		.71					
Writing the method and results section for a research paper for publication		.70					
Writing a paper for a conference proceeding		.67					
Reviewing the literature in an area of research interest		.67					
Using statistical software packages (e.g., SPSS-X, SAS, etc.)			.75				
Manipulating data to input it in a computer system			.70				
Using multivariate statistics (e.g., multiple regression, factor analysis, etc.)			.70				
Writing statistical computer programs			.68		1.22	17.58%	.94
Using simple statistics (e.g., t-test, ANOVA, correlation, etc.)			.67				
Knowing which statistics test to use			.65				
Avoiding the violation of statistical assumptions			.63				
Understanding computer printouts			.58				
Designing an experiment using non-traditional methods (e.g. ethnographic, cybernetic, phenomenological approaches)				.73	1.03	16.36%	.92

Table 2. (continue)

Questionnaire Item	Component				Eigenvalue	EV	Cronbach's alpha
	1	2	3	4			
Designing an experiment plan using traditional methods (e.g. experimental, quasi-experimental designs)				.70			
Formulating scientific hypotheses				.69			
Controlling variables that impact the validity of research results				.65			
Selecting reliable and valid instruments				.64			
Selecting a suitable research topic for study				.59			
Selecting a sample of subjects from a given population (statistical analysis)				.59			
Operationalizing variables of interest				.56			

Note:

- 1- Practical Research Skills
- 2- Writing a Paper for a Journal Publication
- 3- Quantitative and Computer Skills
- 4- Research Design Skills

Research Results

The following discussion interprets the research results concerning each of the research objectives previously defined. Below are the research objectives from the introduction rewritten as research questions and followed by the answers to them.

Research Question 1: Do undergraduate students in the three province-based Cambodian universities differ in their research self-efficacy according to gender, year level, working experience, faculty, and university?

Table 3 shows the respondents' research self-efficacy according to gender, year, and working experience. According to the results of the t-test, there were significant differences in the mean score of the research self-efficacy between the demographic variable attributes analyzed. To illustrate this point, males (Mean = 2.20, SD = .63) generally had a higher score than females (Mean =

2.08, SD = .69) in terms of research self-efficacy ($t [977.15] = 2.70, p < 0.01$). Regarding academic year, Year IV students (Mean = 2.19, SD = .67) were found to be higher than Year III students (Mean = 2.06, SD = .65) in term of research self-efficacy ($t [1,003.801] = 3.16, p < 0.01$). Finally, those with work experience (Mean = 2.17, SD = .69) were found to be higher than those with no experience (M = 2.08, SD = .63) in terms of research self-efficacy ($t [1,007] = 2.00, p < 0.05$). To understand the effect of these variables, the Hedge's g score was computed since the sample sizes for each factor differs. For all variables, the effect size was below 0.2, which means that despite having statistical significance, the effect was small and may not be discernible.

Table 3.

Differences of the research self-efficacy of the respondents according to gender, year and working experience.

Variable	Attribute	Participants Responding(n)	Mean	SD	Effect Size (Hedges' g)	t	p
Gender	Male	439	2.20	.63	0.18	2.70	.007**
	Female	570	2.08	.69			
Year	Year IV	526	2.19	.67	0.2	3.16	.002**
	Year III	483	2.06	.65			
Working Experience	Having experience	575	2.17	.69	0.14	2.00	.046*
	No experience	434	2.08	.63			

Note: SD = Standard Deviation; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$;

Table 4 revealed the significant differences in research self-efficacy among students from different universities at $p < 0.001$ ($F [1,006] = 17.58$). The post hoc comparison using the Tukey HSD test showed the pairwise comparisons of the mean scores among University A, University B, and University C (see Table 4). There was a significant mean score difference between the research self-efficacy scores of the respondents from University A (M = 2.22, SD = .68) and those from University C (M = 1.95, SD = .61), with University A showing a higher rating. The difference of the average between them was .27, and the p -value was below 0.05 ($p = 0.000 < 0.001$). Students from University

B ($M = 2.20$, $SD = .66$) was found to be higher than those from University C ($M = 1.95$, $SD = .61$). The difference of the mean score between them was .25 and the p -value is below 0.05 ($p = 0.000 < 0.001$). There was no significant mean score difference between the research self-efficacy of the respondents from University A and those from University B.

A one-way ANOVA was also conducted to compare the means on the research self-efficacy scores on different faculties (Science and Technology, Business Administration and Tourism, Agriculture and Food Processing, Arts, Humanities and Social science and the Institute of Foreign Language). Results reveal that there was a statistically significant difference at the $p < 0.001$ level among students from these faculties ($F [1,004] = 11.17$).

Table 4.

One-way ANOVA for the respondent's self-efficacy according to faculty and university.

Variable	Attribute	Participants Responding (n)	Mean	SD	F	P
Faculty	Science and Technology	183	2.14	.64	11.17	.000***
	Business Administration and Tourism	276	2.30	.65		
	Agriculture and Food Processing	209	2.12	.65		
	Art, Humanities and Social Sciences	208	1.90	.65		
	Institute of Foreign Language	133	2.15	.06		
University	University A	415	2.22	.68	17.58	.000***
	University B	282	2.20	.66		
	University C	312	1.95	.61		

Note: SD = Standard Deviation; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$;

It can be argued that different faculties require and/or teach students different levels of research skills. For instance, students from the Art, Humanities and Social Sciences faculty may not be expected to exhibit Quantitative and Computer Skills at the same level as students from the

Science and Technology faculty due to the nature of their fields. To investigate possible hidden biases due to this difference, we were interested to know if the self-efficacy trends across subscales was consistent throughout each faculty. Figure 1 showed that each faculty had a similar trend for self-efficacy scores, thus we believe that the results we arrived at still hold regardless of the faculty.

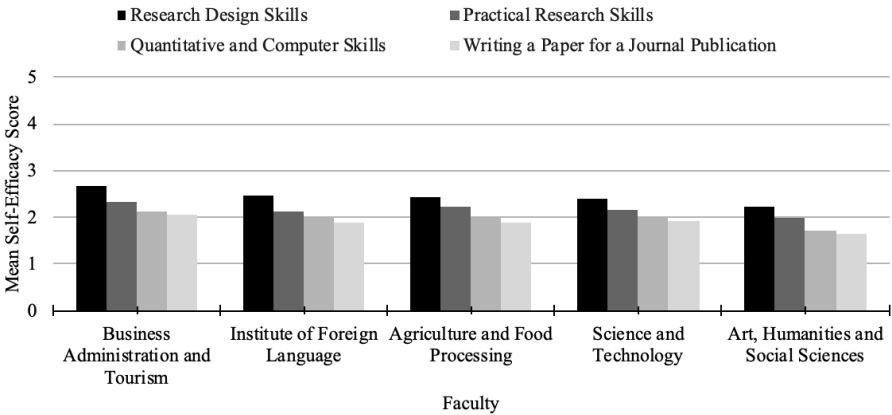


Figure 1. Comparing mean scores for subscales of research self-efficacy versus faculty.

We were also interested to know if trends persist when broken down to each university, faculty, and academic year. Since all of these factors pertain to the academic environment, it may be worthy to analyze these factors from a multilevel perspective, where the universities, faculty, and student’s academic year are compared. Before proceeding further to this multi-level analysis, we first gauged if such additional analysis would provide new results by looking at trends at the more granular level to see if the previous overall results still hold. Figure 2 shows that except for University A’s Art, Humanities, and Social Sciences faculty and University C’s Agriculture and Processing and Art, Humanities, and Social Sciences faculties, the result that Year IV students perform better than Year III students persists. The Business Administration and Tourism, Institute of Foreign Language, and Science and Technology faculties across universities were high performers. Thus,

previously observed trends persist, hence we decided not to proceed with further analysis.



Figure 2. Mean scores of research self-efficacy per university, faculty and year level

Research Question 2: What is the overall level of research self-efficacy of Cambodia’s undergraduate students in the province-based universities?

Respondents rated their level of confidence on each item using a 5-point Likert scale rating (1 = Strongly Not Confident, 2 = Not Confident, 3 = Moderately Confident, 4 = Confident, and 5 = Strongly Confident). Figure 3 indicated that respondents’ level of confidence in research self-efficacy in the four subscale items was under the mean score value of 3 of the Likert scale. It revealed that the respondents have low levels of research self-efficacy. Their mean scores’ level of self-efficacy ranged from a low of 1.89 (writing papers for publication) to a high of 2.46 (practical research skills).

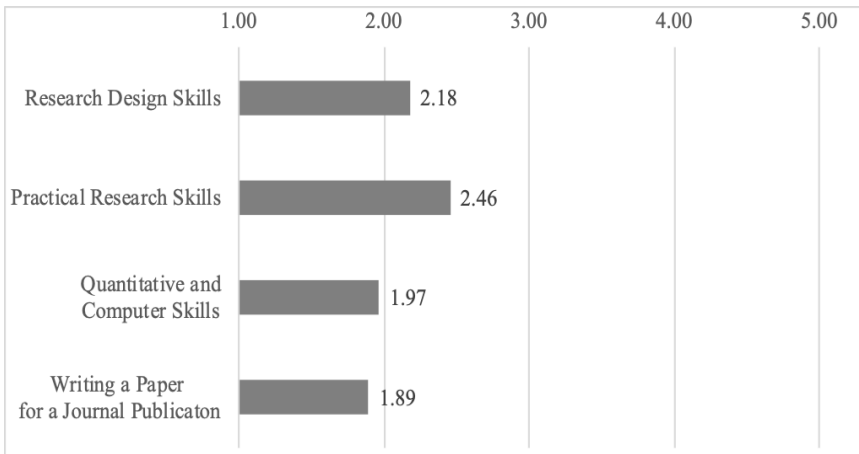


Figure 3. Comparing mean scores of subscales of research self-efficacy of Cambodia’s undergraduate students at province-based universities.

Table 5 showed that 68.9% of the respondents were not confident in designing an experimental research plan using traditional methods (e.g. experimental, quasi-experimental designs). Furthermore, most of the respondents were not confident in their ability to select reliable and valid instruments at 74.6%, formulate scientific hypotheses at 72.7%, and design an experiment using non-traditional methods (e.g. ethnographic, cybernetic, phenomenological approaches) at 71.4%.

Overall, the level of the subscale of respondents with research design skills achievement items have scored very low in all subscales: there were only 8.6% of the respondents who were confident in operationalizing variables of interest, while 59.4% of them were not confident. Table 5 also shows that the highest mean was on the respondent’s confidence in selecting a suitable research topic for study at 12.1% (mean = 2.54, SD = .90). Generally, we may conclude that the respondents lack confidence in their knowledge of the purpose and nature of the research, the research methods to be used, the methods for collecting data, the techniques for data analysis and presentation, designing experiment, and statistical analysis and financial constraints.

Table 5.

Descriptive statistics on Likert scale responses to the research design skills subscale (n=1009).

	1 = Strongly Not Confident <i>f</i> (%)	2 = Not Confident <i>f</i> (%)	3 = Moderately Confident <i>f</i> (%)	4 = Confident <i>f</i> (%)	5 = Strongly Confident <i>f</i> (%)	Mean	SD
Selecting a suitable research topic for study	129(12.8)	346(34.3)	412(40.8)	108(10.7)	14(1.4)	2.54	.90
Designing an experiment using non-traditional methods (e.g. ethnographic, cybernetic, phenomenological approaches)	252(25.0)	468(46.4)	245(24.3)	42(4.2)	2(.2)	2.08	.82
Designing an experiment plan using traditional methods (e.g. experimental, quasi-experimental designs)	275(27.3)	420(41.6)	269(26.7)	41(4.1)	4(.4)	2.09	.85
Controlling variables that impact the validity of research results	236(23.4)	411(40.7)	293(29.0)	64(6.3)	5(.5)	2.20	.89
Formulating scientific hypotheses	281(27.8)	453(44.9)	217(21.5)	50(5.0)	8(.8)	2.06	.87
Selecting a sample of subjects from a given population (statistical analysis)	239(23.7)	400(39.6)	301(29.8)	59(5.8)	10(1.0)	2.21	.90
Selecting reliable and valid instruments	342(33.9)	411(40.7)	208(20.6)	44(4.4)	4(.4)	1.97	.87
Operationalizing variables of interest	212(21.0)	387(38.4)	323(32.0)	75(7.4)	12(1.2)	2.29	.92

Table 6 reveals that more than 50% of the respondents were not confident about indirectly contacting researchers currently working in the same areas of research interest. Most of the lecture assignments in Cambodia's province-based universities provided students with tasks done in teams or groups hence they did not require individual submission. Presentations delivered to students prepared based upon fieldwork also do not give some of them enough confidence to stand up for themselves or believe in their capacities to become more responsible in their life as students as their team or group leaders usually do most of the work. This could further be demonstrated by the result where most of the respondent were not confident in their ability in orally defending a thesis or dissertation 65.9%, acquiring research funding to help pay for research 63.4%, and getting an adequate number of research participants 54.8%.

The overall level of the respondents on the practical research skills subscale achievement items have scored very low; there were only 19.8% of the respondents confident in allocating time for research, and 41.1% of them are not confident with this. Table 6 also showed that the highest means were on confident record keeping during a research project 20.1 percent (mean = 2.69, SD = 1.00), collecting data 15.1 percent (mean = 2.54, SD = .97), and understanding how to seek help 14.1 percent (mean = 2.51, SD = .96). Generally, we may conclude that when it comes to the practical research skills of the respondents, there is lack of deep thinking, lack of effective combination and refining of materials, and insufficient understanding of the content.

Table 6.

Descriptive statistics on Likert scale responses to the practical research skills subscale (n=1009).

Practical Research Skills	1 = Strongly Not Confident f(%)	2 = Not Confident f(%)	3 = Moderately Confident f(%)	4= Confident f(%)	5 = Strongly Confident f(%)	Mean	SD
Gathering an adequate number of participants for a research study	165(16.4)	387(38.4)	354(35.1)	88(8.7)	15(1.5)	2.41	.91
Keeping written records during a research project	136(13.5)	275(27.3)	395(39.1)	174(17.2)	29(2.9)	2.69	1.00
Collecting data	147(14.6)	348(34.5)	362(35.9)	129(12.8)	23(2.3)	2.54	.97
Making time for research	124(12.3)	291(28.8)	394(39.0)	172(17.0)	28(2.8)	2.20	.98
Contacting researchers currently working in an area of research interest	170(16.8)	348(34.5)	364(36.1)	117(11.6)	10(1.)	2.45	.94
Understanding how to seek help	155(15.4)	346(34.3)	366(36.3)	120(11.9)	22(2.2)	2.51	.96
Defending a thesis or dissertation	277(27.5)	387(38.4)	249(24.7)	87(8.6)	9(9)	2.17	.96
How to seek research funding	275(27.3)	395(39.1)	236(23.4)	86(8.5)	17(1.7)	2.18	.98

Table 7 revealed that 74.3% of the respondents were not confident about knowing which statistical test to use for data analysis. This is because they had insufficient knowledge of statistics and data analytics software. While they studied computer applications such as word processing, spreadsheets, and statistics concepts in mathematics during their first year, there is still a lack of computer-based data analysis experience. This led to decreased knowledge in quantitative research. Furthermore, most respondents were not confident in the following: writing statistical computer programs at 77.7%, using a statistical software package (e.g., SPSS-X, SAS, etc.) at 77.2%, and avoiding the violation of statistical assumptions at 74.4%. This could be because the universities do not provide access to courses teaching how to use these programs.

The overall level of the subscale of undergraduate students with quantitative and computer skills achievement items was very low; only 7.6% of the respondents were confident in understanding computer printouts, 68.8% of them were not confident with this. In addition, just 6.2% of the undergraduate students were confident with manipulating data to input in a computer system. In contrast, 72.6% had a contrary opinion about the statement. Table 7 also shows that the highest mean score is in using multivariate statistics (e.g., multiple regression, factor analysis, etc.): 3.0% (mean = 2.81, SD = .79). We may conclude that the lack of quantitative and computer skills of the respondents are in the areas of statistical assumptions, use of statistical software, and analysis of related qualitative data (e.g. textual data from interview scripts, and fieldwork notes, etc.).

Table 7.

Descriptive statistics on Likert scale responses to the quantitative and computer skills subscale (n=1009).

Quantitative and Computer Skills	1 = Strongly Not Confident f(%)	2 = Not Confident f(%)	3 = Moderately Confident f(%)	4 = Confident f(%)	5 = Strongly Confident f(%)	Mean	SD
Knowing which statistics test to use	313(31.0)	437(43.3)	218(21.6)	38(3.8)	3(.3)	1.99	.84
Manipulating data to input it in a computer system	342(33.9)	390(38.7)	215(21.3)	58(5.8)	4(.4)	2.00	.90
Avoiding the violation of statistical assumptions	339(33.6)	412(40.8)	212(21.0)	44(4.4)	2(.2)	1.97	.86
Using simple statistics (e.g., t-test, ANOVA, correlation, etc.)	284(28.1)	420(41.6)	257(25.5)	39(3.9)	9(.9)	2.08	.88
Understanding computer printouts	307(30.4)	387(38.4)	238(23.6)	68(6.7)	9(.9)	2.09	.94
Using multivariate statistics (e.g., multiple regression, factor analysis, etc.)	389(38.6)	451(44.7)	139(13.8)	28(2.8)	2(.2)	2.81	.79
Using statistical software packages (e.g., SPSS-X, SAS, etc.)	365(36.2)	414(41.0)	190(18.8)	38(3.8)	2(.2)	1.91	.84
Writing statistical computer programs	379(37.3)	408(40.4)	179(17.7)	38(3.8)	5(.5)	1.89	.86

Table 8 shows that 57.1% of the respondents were not confident in writing the introduction and literature review for a thesis. This is because the

respondents may have insufficient skills and knowledge on writing the introduction and literature review. They have difficulty understanding papers written in English due to insufficient English proficiency. They also lack literature review strategies such as categorizing materials according to its importance before putting everything together and integrating their own opinions by reading and researching the materials further. Most of the respondents were not confident in writing the introduction and discussion sections of a research paper for publication at 82.4%, being able to write the method and results section for a research paper for publication at 80.0% and being able to write the method and results in sections of a dissertation and thesis at 78.8%.

The overall level of the subscale of undergraduate students for writing a paper for a journal publication subscale achievement items have scored very low in all subscales; there were only 4.9% of the respondents who stated that they are confident in reviewing the literature, and 70.4% said they are not confident in the area of research interest. Table 8 shows that the highest mean on the respondents' confidence in writing a paper for a conference proceeding is 3.3% (mean = 2.93, SD = .83). Usually, these results would make a researcher conclude that the respondents lack English proficiency which may be the main reason, but also a lack of academic materials to prepare the literature may also be an issue. The databases in some university libraries in Cambodia are not comprehensive if they involve a journal subscription to access relevant articles. But this alone should not be a deterrent since they can obtain documents or papers through open access on the Internet.

Table 8.

Descriptive statistics on Likert scale responses to the writing a paper for a journal publication subscale (n=1009).

Writing a Paper for a Journal Publication	1 = Strongly Not Confident f(%)	2 = Not Confident f(%)	3 = Moderately Confident f(%)	4 = Confident f(%)	5 = Strongly Confident f(%)	Mean	SD
Writing a paper for a conference proceeding	346(34.3)	425(42.1)	205(20.3)	30(3.0)	3(.3)	2.93	.83
Writing the method and results section for a research paper for publication	385(38.2)	422(41.8)	169(16.7)	29(2.9)	4(.4)	1.86	.82
Writing a discussion section for a thesis or dissertation	376(37.3)	425(41.1)	170(16.8)	32(3.2)	6(.6)	1.88	.84
Writing the introduction and literature review for a thesis	376(37.3)	401(19.8)	200(19.8)	29(2.9)	3(.3)	1.89	.84
Reviewing the literature in an area of research interest	277(27.5)	433(42.9)	250(24.8)	43(4.3)	6(.6)	2.08	.86
Writing the introduction and discussion sections for a research paper for publication	419(41.5)	413(40.9)	152(15.1)	24(2.4)	1(.1)	1.79	.78
Writing the method and results sections of a dissertation and thesis	402(39.8)	391(38.8)	182(18.0)	34(3.4)	0	1.85	.83

Discussions and Implications

Low Research Self-efficacy and Curriculum Perspective

The respondents showed low levels of self-efficacy in the key subscales of research self-efficacy; the mean score values are consistently less than 3. It is safe to assume that undergraduate students lack confidence and do not believe they have the ability to conduct research. Within the subscales of research self-efficacy, the highest mean score was achieved for practical research skill, while the lowest was in writing a research paper for a journal publication.

As mentioned in the literature review, a faculty's research capability can affect a student's research self-efficacy. Hence, there is a need to increase the research ability of faculty members at the university level through professional development programs to make them more effective in research as well as to become future researchers or research advisers. Universities should also consider conducting workshops intended to promote research interest among students and faculty. Educational interventions and short-term workshops are helpful in increasing research self-efficacy (Bakken et al., 2010). Training all university staff not only in research methodologies including hypothesis testing but also in ICT use is recommended (Mapolisa & Mubika, 2013). The three Cambodian province-based universities selected in this study were lacking in research-related courses, technologies for research, and research workshops, among others. All these institution-related challenges can negatively impact the respondents' capacities to conduct research (Mapolisa & Mubika, 2013).

Research topics in the curricula of bachelor's programs should also be investigated. All the universities involved in this study only introduced a research methods class to fourth-year students, and it only focuses on the theoretical background related to research methods. Actual research execution (either in the industry sector or within the academe), which can lead to increased research self-efficacy and ability, were not given sufficient attention in this course. Research opportunities should be introduced and reinforced into the university culture (Eam & Seng 2017).

There is also a need to understand more clearly how each individual's research motivation and self-efficacy is constructed, and to determine the best method of increasing motivation and conducting research (Bailey, 1999). For

a bachelor's thesis or research activity to be successful, students need to fulfill writing and research method course requirement as well as have the motivation and supportive research adviser (Tan, 2007). Universities should allow their students to explore other disciplines that could pique their interest and increase their motivation through extra-curricular activities or setting up visits to multiple faculty laboratories to learn about research topics. These could include research-focused internship programs or other activities that are more experiential and not limited to the classroom setting (Boswell, 2013) (Chen et al., 2007). An example of this is a Tokyo Institute of Technology's course offered to third year undergraduate students to visit several professor's laboratories within their department to see how laboratories are operated and to give them an idea of what is research and the topics being investigated; they can then use this experience in deciding what research topic they plan to pursue on their 4th year individual research project (Tokyo Institute Technology, 2018).

Factors Related to the Research Self-efficacy

While the effect may be small, this study revealed that males have higher measured research self-efficacy than females. This difference may be due to females' perceived lack of interest in research. In improving the research self-efficacy of the female undergraduate students, each university should provide better training and research exposures to those who have low self-efficacy before they undertake an actual research project. Cambodian research programs implemented in the universities should give more focus on gender equity by engaging the female students in research training to transform their attitudes positively toward research.

There was a significantly higher number of students in the fourth-year who had higher efficacy than the third-year students. While this may be expected since it is known beforehand that third year students were not introduced to research courses, overall it must be noted that the students' academic year effect was small. This is counterintuitive since aside from having more academic experience, the research course should have given the fourth-year students more boost in research self-efficacy. This serves as an impetus to reinvestigate the effectiveness of research courses offered to fourth year students, which is a factor where educators can exercise more control and is

thus worth analyzing. Every university in our study needs to update its vision and mission statements to give research importance in the bachelor's curriculum and as such, provide a suitable academic road map for their undergraduate students. The students' acquisition of knowledge until they reach the fourth-year should be holistically considered as they enter the field of basic research; research orientation, research skills development, and practical experience must be provided to the students in order to successfully graduate after having conducted a research project which is assessed will allow them to develop the necessary skills.

Undergraduate students with work experience scored significantly higher albeit the effect was small; they have more confidence in their research self-efficacy than those without work experience. Their workplaces allow scientific approaches to be inculcated in their work and employees are normally expected to follow plans and systematic procedures. Additionally, conducting research in Cambodian universities can be very bureaucratic. Research in Cambodian universities is allowed after a very tedious approval process with all stakeholders, and can only be conducted for the period specified with prior approval. Those who have jobs can choose to work on their theses in their workplaces instead of the university, thus skipping this unnecessary overhead.

Undergraduate students who have no work experience also have limited time to conduct actual research activities since most of their time is spent on adjunct activities such as building social networks. They do not have neither the social network capital nor the work ethics that students with work experience have developed through their jobs. As an implication, universities should aim to give work opportunities or internships to undergraduate students. Program experiences should create opportunities for relationship building, authentic leadership experiences working with others, and perseverance to build self-efficacy (Versland, 2016).

The research self-efficacy of the undergraduate students at the faculty of Business Administration and Tourism was high compared to other faculties. One of the reasons is that the professors in the said faculty also had high research self-efficacy. This faculty is a popular choice among students because of the job prospects particularly in the fields of finance and banking, accounting, management and tourism; its good reputation also attracts the most skilled faculty members. For undergraduate students, being mentored by

a faculty member known to have brilliant ideas contributed much to the student's knowledge in his/her discipline (Wenzel, 2003). Cambodian academics who pursued their degrees in other countries are more likely to continue to participate in research activities than those who graduated from a local university (Eam 2015a). In addition, they are also sometimes required by their sponsor countries to conduct research in their home country. Hence, to increase research self-efficacy of undergraduate students at other faculties such as the Faculty of Science and Technology, they should hold research workshops, provide examples of practical research, and enhance their human resource development through education abroad.

Another contributing factor is that most province-based Cambodian universities have research-related subjects focused on market research, which is more of a functional research than theoretical in nature. Undergraduate students were involved in the process of research activities such as gathering data about certain companies or non-governmental organizations. Hence, these students had more opportunities to apply their research training compared to students in other faculties.

The faculty of Business Administration and Tourism also have better resources compared to other faculties. It is supported by various academic resources and also funded by external donors. They have the resources to have text and research books translated into the Cambodian language, which are easier to understand compared to the course contents of other faculties. Most of the books at university libraries are related to finance, banking, management, accounting and tourism. The combined effects of close mentoring, actual research experience, access to resources, and possibly motivation to perform well to benefit from good job prospects are strong causes for students from this faculty to have higher research self-efficacy.

The relatively low performance of the Faculty of Science and Technology can seem contradictory since recently, the MoEYS announced the policy to promote science education. The MoEYS adopted a Policy on Science, Technology, Engineering, and Mathematics (STEM) with the aim to improve the capacities of students to develop highly qualified and responsible human resources in STEM areas for the country's sustainable and inclusive development (MoEYS, 2018). This MoEYS position is a promising step for province-based Cambodian universities; according to the Innovation in Southeast Asia report released by OECD in 2013, one of Cambodia's strength

when compared to other Southeast Asian countries (included in the report: Cambodia, Indonesia, Malaysia, Singapore, Thailand, and Vietnam) is the accumulated experience of its public agencies in promoting science and technology (OECD, 2013). But the improvements should not just be limited to the Faculty of Science and Technology; actions should also be taken to promote the faculties of Agriculture and Food Processing, Institute of Foreign language and Arts, Humanities and Social Science.

One of the reasons of the difference in research self-efficacy across universities is due to the instructors' ability to do research and past experiences. For example, University A and University B are more productive research-wise with seven and five international publications, respectively, as opposed to University C which has just one paper published as of September 2019 as reported by each university. University A and University B also have highly developed human resources since most of their faculty members earned their masters and some earned doctoral degrees from abroad. Also, University A and University B had longer historical background than University C. University A and B have built their networks and exchange information with and have signed several Memorandum of Understanding (MoU) with famed universities overseas. University teachers at University A and University B also had several chances to join workshops and conferences in collaboration with partner universities abroad. They bring home with them lessons learned through their research experience, research environment, and research facilities. It is important to note that University C was only established four years ago, thus they have the least experienced faculty members and the least developed academic network when compared to University A and University B.

As an implication, province-based Cambodian universities should consider building their academic network with institutions to develop their human resources and increase their research potential. They should also consider signing memorandums of agreement (MoUs) to exchange information with universities abroad in order to have an opportunity to create mutually beneficial research programs with well-known universities (e.g. exposing potential partners to research opportunities that are unique to Cambodia and Southeast Asia). Universities should also consider collaborations within the country and within the Southeast Asian region for student exchange programs, internship programs, research workshops and academic conferences.

Programs like the Japan International Cooperation Agency’s (JICA) Dispatch of Technical Cooperation Experts can be used as models for collaboration and staff training (JICA, 2001).

The universities may also want to consider changing their system from an exclusively teaching-oriented university to also support research-oriented activities. Cambodia needs to define a clear vision and direction for research and development with educational institutions in order to ensure future growth and support a research culture (Eam, 2015c).

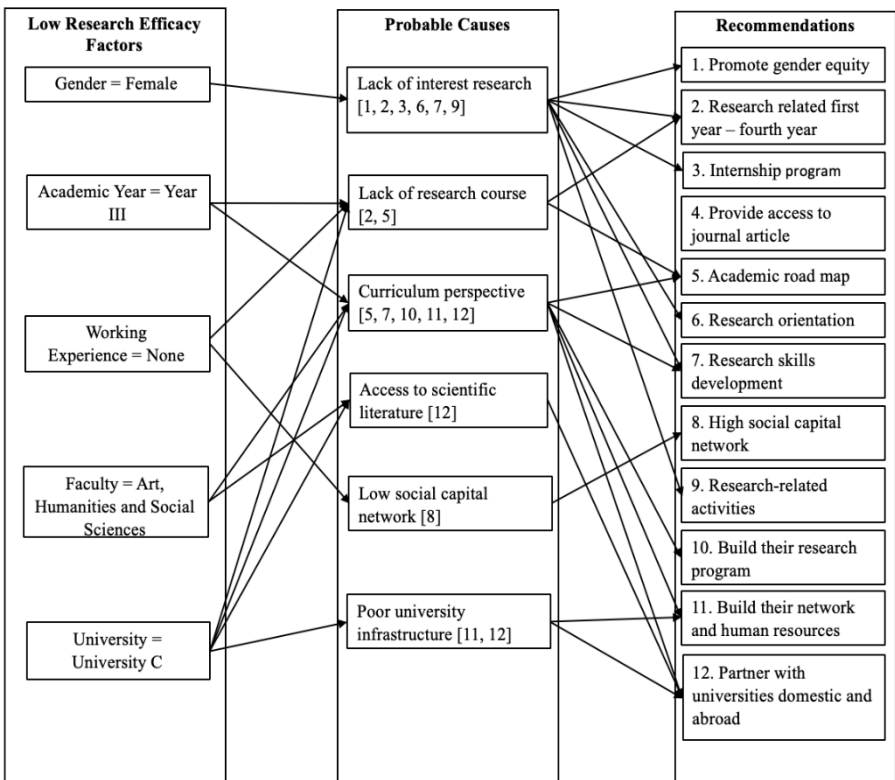


Figure 4. Summary of Self-Efficacy Factors, Probable Causes and Policy Recommendations are indicated in square brackets.

A robust research culture could further lead to producing more qualified scientists and talented graduates to fuel Cambodia's innovation and economic growth.

Current Limitations and Further Studies

A further advancement of the current work could involve collecting similar data from city-based universities to have a one-to-one comparison. More stringent factors should also be tested; for instance, recorded faculty research skill levels, research infrastructure on a department level, and other contextual variables can be controlled for during data collection. Another area for improvement is gathering data related to the existing research training received by the students and the instructors in the faculties they are enrolled in. The original research on SERM notes that research training environment directly correlates with research self-efficacy (Phillips and Russell, 1994). Currently, we only deduced this information based on what we know about the presence of work experience, universities, faculties, year levels, and curricula made available to students. We were not able to account for concrete sources of research training (e.g., external workshops) that the students may have received. Information about the research training of faculty members is also lacking.

Conclusion

Based on the results of this study, the research self-efficacy of Cambodia's undergraduate students in the selected province-based universities is low when assessed using SERM. Considering that students with good research self-efficacy are important in developing future scientists, these findings explain why Cambodia lacks scientific manpower. This corroborates with the OECD's assessment that one of Cambodia's weakness in the Southeast Asian innovation arena is its lack of scientists. There was a significant difference between the research self-efficacy scores of the respondents according to their demographic attributes and respective faculties and universities. After analyzing probable causes and parallel observations done by other researchers observing research self-efficacy, we believe that each university must examine and consider improving their curriculum design, research materials,

and facilities to improve the research skills of their students. Developing the research capacities of its students should also be a part of their vision and mission so that other stakeholders will support it. Each university must set a clear goal for their faculty members to also increase their capacity as researchers through collaboration and human resource development activities. The government also has a big role in improving student research self-efficacy. All HEIs in Cambodia are under the MoEYS, and it should be clear to all the policymakers that the MoEYS has a strong mission and vision to change the attitude of university students in order to increase their ability to undertake research activities. Although this research was conducted in Cambodia, we believe it has implications for other developing countries that are developing their higher education institutions away from their capital cities.

Acknowledgements

The authors sincerely thank Dr. Eam Phylrom at the Cambodia Development Resource Institute for his contributions to this paper by providing literature, reviewing, and by providing comments on the literature review, discussion section, conclusions and future directions. The first author also sincerely appreciates the support and scholarship provided by the JICA (Japan International Cooperation Agency) AUN/SEED-Net program.

Notes

1 Source: Printed Curriculum for Undergraduate Level of University A (2001), of University B (2007) and of University C (2014).

References

- Bailey, J. G. (1999). Academics' motivation and self-efficacy for teaching and research. *Higher Education Research & Development*, 18(3), 343–359. <http://doi.org/10.1080/0729436990180305>
- Bakken, L. L., Byars-Winston, A., Gundermann, D. M., Ward, E. C., Slattery, A., King, A., ... Taylor, R. E. (2010). Effects of an educational intervention on female biomedical scientists' research

- self-efficacy. *Advances in Health Sciences Education*, 15(2), 167–183. <http://doi.org/10.1007/s10459-009-9190-2>
- Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist*, 37(2), 122–147. <http://doi.org/10.1037/0003-066X.37.2.122>
- Boswell, S. S. (2013). Undergraduates' perceived knowledge, self-efficacy, and interest in social science research. *The Journal of Effective Teaching*, 13(2), 48–57. http://www.uncw.edu/jet/articles/vol13_2/boswell.pdf
- Chen, C. Y., Sok, P., & Sok, K. (2007). Benchmarking potential factors leading to education quality: A study of Cambodian higher education. *Quality Assurance in Education*, 15(2), 128–148. <http://doi.org/10.1108/09684880710748901>
- Eam, P. (2015a). Factors differentiating research involvement among faculty members: A perspective from Cambodia. *Excellence in Higher Education*, 6(1&2), 1–11. <http://doi.org/10.5195/ehe.2015.133>
- Eam, P. (2015b). Faculty involvement in research activities at Cambodian public higher education institutions: Trends, patterns and key characteristics. *International Journal of Comparative Education and Development*, 17(2), 97–114. https://www.academia.edu/34676350/Faculty_Involvement_in_Research_Activities_at_Cambodian_Public_Higher_Education_Institutions_Trends_Patterns_and_Key_Characteristics
- Eam, P. (2015c). Investigating relationship among research self-efficacy, research outcome expectation, and research interest of Cambodian faculty: Testing social-cognitive theory. *International Journal of Sociology of Education*, 4(3), 199–224. doi: <http://doi.org/10.17583/rise.2015.1752>
- Eam, P. (2017). *A study on the relationship between research ability and mindset of Cambodian faculty members and their research outputs: A perspective from fifteen higher education institutions* (Doctoral dissertation). https://ir.lib.hiroshima-u.ac.jp/files/public/4/43691/20170707140055932770/k7318_3.pdf
- Eam, P., & Seng, C. (2017). A path analysis of Cambodian faculty's research intention: Focusing on direct and mediating effects at individual level. *International Journal of Sociology of Education*,

- 6(3), 271–295. doi: <http://doi.org/10.17583/rise.2017.2777>
- JICA. (2001). *Dispatch of technical cooperation experts*.
<https://www.jica.go.jp/english/publications/reports/annual/2001/pdf/200119.pdf>
- Leedy, P. and Ormrod, J. (2001). *Practical research: Planning and design* (7th ed.). Merrill Prentice Hall and SAGE Publications, Upper Saddle River, NJ and Thousand Oaks, CA.
- Mapolisa, T., & Mubika, A. K. (2013). Total quality management: The pathway to quality research supervision of the postgraduate diploma in education programme at the Zimbabwe open university. *International Journal of Asian Social Science*, 3(2), 308–320.
https://www.academia.edu/24922484/Total_Quality_Management_The_Pathway_to_Quality_Research_Supervision_of_the_Postgraduate_Diploma_in_Education_Programme_at_the_Zimbabwe_Open_University?auto=download
- Ministry of Education, Youth and Sport. (2017). *Cambodian higher education roadmap 2030 and beyond*. Phnom Penh: MoEYS Publication.
<https://drive.google.com/file/d/0B1ekqZE5ZIUJSVhjN2E2UFJBQVU/view>
- Ministry of Education, Youth and Sport [MoEYS]. (2018). *The STEM brochure*. Phnom Penh: MoEYS Publication.
- Ngoy, M., Say, S., & Leang, U. (2019). Governance in public higher education in Cambodia. *CDRI Working Paper Series No. 114*. Phnom Penh: CDRI.
https://www.academia.edu/40029398/Governance_in_Public_Higher_Education_in_Cambodia
- OECD. (2013). *Innovation in Southeast Asia. OECD Reviews of Innovation Policy*, OECD Publishing, Paris.
<http://doi.org/10.1787/9789264128712-en>
- Oguan, J. F. E., Bernal, M. M., & Pinca, C. M. D. (2014). Attitude and anxiety towards research, its influence on the students' achievement in the course. *Asian Journal of Management Sciences & Education*, 3(4), 165–172. Retrieved from [http://www.ajmse.leena-luna.co.jp/AJMSEPDFs/Vol.3\(4\)/AJMSE2014\(3.4-14\).pdf](http://www.ajmse.leena-luna.co.jp/AJMSEPDFs/Vol.3(4)/AJMSE2014(3.4-14).pdf)
- Papanastasiou, E. C. (2005). Factor structure of the “attitudes toward

research” scale. *Statistics Education Research Journal*, 4(1), 16–26.
<http://doi.org/10.1037/t64085-000>

Phillips, J. C., & Russell, R. K. (1994). Research self-efficacy, the research training environment, and research productivity among graduate student in counseling psychology. *The Counseling Psychologist*, 22(4), 628–641 <http://doi.org/10.1177/0011000094224008>

Prieto, L. L. (2009). *Exploring the power of self-efficacy at work: Some empirical studies from the social cognitive perspective* (Doctoral dissertation, Universitat Jaume I, Departament de Psicologia Evolutiva, Educativa, Social i Metodologia).
https://www.researchgate.net/profile/Isabel_Martinez7/publication/44016270_Exploring_the_Power_of_Self-efficacy_at_Work_Some_Empirical_Studies_from_the_Social_Cognitive_Theory/links/0912f50ceedf0e5112000000.pdf

Reisel, J. R., Cancado, L., Walker, C. M., & Mitrayani, D. (2015). Defining a successful undergraduate research experience in engineering. In *Proceedings of the ASEE Annual Conference & Exposition* (pp. 1-13). <https://www.asee.org/public/conferences/56/papers/11108/view>

Sachitra, V., & Bandara, U. (2017). Measuring the academic self-efficacy of undergraduates: The role of gender and academic year experience. *International Journal of Educational and Pedagogical Sciences*, 11(11), 2363–2368. <https://waset.org/publications/10008065/>

Sam, R., Zain, A. N. M., & Jamil, H. (2012). Cambodia’s higher education development in historical perspectives (1863-2012). *International Journal of Learning and Development*, 2(2), 224–241.
<http://doi.org/10.5296/ijld.v2i2.1670>

Saral, D. G., & Reyhanlioğlu, D. (2015). An analysis of educational faculty students’ research self-efficacy in terms of a number of variables. *Procedia - Social and Behavioral Sciences*, 174, 1138–1145.
<http://doi.org/10.1016/j.sbspro.2015.01.729>

Shaffer, C. A. (2006). Experiences teaching a graduate research methods course. *ACM SIGCSE Bulletin*, 38(2), 97-101.
<http://doi.org/10.1145/1138403.1138442>

Sizemore, O. J., & Lewandowski, G. W. (2009). Learning might not equal liking: Research methods course changes knowledge but not attitudes. *Teaching of Psychology*, 36, 90–95.

<http://doi.org/10.1080/00986280902739727>

Tan, E. B. (2007). Research experiences of undergraduate students at a comprehensive university. *International Journal of Teaching and Learning in Higher Education*, 19(3), 205-215.

<http://www.isetl.org/ijtlhe/pdf/IJTLHE158.pdf>

Tiyuri, A., Saberi, B., Miri, M., Shahrestanaki, E., Bayat, B. B., & Salehiniya, H. (2018). Research self-efficacy and its relationship with academic performance in postgraduate students of Tehran University of Medical Sciences in 2016. *Journal of Education and Health Promotion*, 7, 1–6. http://doi.org/10.4103/jehp.jehp_43_17

Tokyo Institute Technology Open Course Ware. (2018). *Research opportunity in laboratories (TSE) Syllabus*.

<http://www.ocw.titech.ac.jp/index.php?module=General&action=T0300&JWC=201802721&lang=EN&vid=03>

Un, L., & Sok, S. (2018). Higher education systems and institutions, Cambodia. In *Encyclopedia of International Higher Education Systems and Institutions*. (pp. 1–10). http://doi.org/10.1007/978-94-017-9553-1_500-1

Versland, T. M. (2016). Exploring self-efficacy in education leadership programs. *Journal of Research on Leadership Education*, 11(3), 298–320. <http://doi.org/10.1177/1942775115618503>

Walliman, N. (2011). *Research methods: The basics*. New York: Routledge. https://edisciplinas.usp.br/pluginfile.php/2317618/mod_resource/content/1/BLOCO%20_Research%20Methods%20The%20Basics.pdf

Wenzel, T. (2003). *Definitions of undergraduate research*. <http://cms-content.bates.edu/prebuilt/chem-definition.pdf>

Williams, D., & Coles, L. (2003). *The use of research by teachers: Information literacy, access and attitudes*. Aberdeen, SD: Economic and Social Research Council. <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.488.3873&rep=rep1&type=pdf>

Chevuth Seng is a doctoral student at the Tokyo Institute of Technology, Japan

May Kristine Jonson Carlon is a doctoral student at the Tokyo Institute of Technology, Japan

Jeffrey Scott Cross is a professor at the Tokyo Institute of Technology, Japan

Contact Address: cross.j.aa@m.titech.ac.jp