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NEW GENERATION PEDAGOGICAL RESEARCH CENTER

ទស្សនៈរបស់គ្រូទៅលើការប្រើប្រាស់កម្មវិធី ICT ក្នុងការបង្រៀន
មុខវិជ្ជារូបវិទ្យា

Teachers' Perspectives of Using ICT Applications Software
in Teaching Physics Subject

A Mini-Thesis
In Partial Fulfilment of the Requirement for
Master's Degree of Education in Mentoring

Yun Sinot

December 2022

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Teachers' Perspectives of Using ICT Applications Software in
Teaching Physics Subject

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December 2022

មូលនិយមសង្ខេប

ការសិក្សាស្រាវជ្រាវនេះមានគោលបំណងពីរធំៗ។ គោលបំណងទីមួយ ស្វែងយល់ពី ទស្សនៈរបស់គ្រូការបញ្ចូលICTទៅក្នុងការបង្រៀនមុខវិជ្ជារូបវិទ្យា។ គោលបំណងទីពីរ បានបង្ហាញ អំពីICTជាជំនួយដល់ការបង្រៀននិងរៀនមុខវិជ្ជារូបវិទ្យា។ ការសិក្សានេះប្រព្រឹត្តទៅតាមការសិក្សា តាមបែបគុណវិស័យ ហើយការជ្រើសរើសសំណាកតាមរយៈសំណាកដែលមានគោលបំណង ច្បាស់លាស់ (purposive sampling) ដែលត្រូវបានប្រើប្រាស់ក្នុងការស្រាវជ្រាវនេះ។ លោកគ្រូ- អ្នកគ្រូដែលបង្រៀនចំនួនប្រាំនាក់នៅវិទ្យាល័យព្រែកលៀបសាលារៀនជំនាន់ថ្មី ត្រូវបានជ្រើសរើស ឱ្យចូលរួមក្នុងការសិក្សានេះ ហើយការជ្រើសរើសតាមរយៈបទពិសោធន៍ ការងារបង្រៀន និងបង្រៀនមុខវិជ្ជារូបវិទ្យា។ ការប្រមូលទិន្នន័យធ្វើឡើងតាមរយៈការសំភាសន៍ដោយប្រើប្រាស់ បែបSemi-structured interview។

តាមរយៈការវិភាគទិន្នន័យនៃការសម្ភារបានបង្ហាញឱ្យឃើញថា៖ ក) លោកគ្រូ-អ្នកគ្រូ ទាំងអស់មានការលើកទឹកចិត្តឱ្យប្រើប្រាស់កម្មវិធីICTក្នុងការបង្រៀនដើម្បីឱ្យមេរៀនមានការទាក់ ទាញចំណាប់អារម្មណ៍ពីកូនសិស្ស។ ពួកគាត់ប្រើប្រាស់ICTដើម្បីបង្កើតកិច្ចតែងការបង្រៀន ស្ថាយសម្រាប់ការធ្វើបទបង្ហាញ សម្ភារឧបទេស និងការវាយតម្លៃ។ កម្មវិធីដែលប្រើប្រាស់ភាគ ច្រើនមានដូចជា៖ កម្មវិធីការិយាល័យ កម្មវិធីកាត់តវីដេអូ ការវាយតម្លៃតាមប្រព័ន្ធអនឡាញ និងការពិសោធន៍សិប្បនិម្មិតជាដើម។ ខ) ICTបានចូលរួមបង្កើននូវការបំពេញសកម្មភាពបង្រៀន និងរៀន។ លោកគ្រូ-អ្នកគ្រូចំណេញពេលវេលាក្នុងការរៀបចំមេរៀនដោយសារតែមេរៀនទាំងអស់ ត្រូវបានធ្វើនៅលើកុំព្យូទ័រ និងអាចយកមកប្រើប្រាស់បាននៅពេលក្រោយទៀត។ វាអាចបង្កើន ចំណាប់អារម្មណ៍របស់សិស្សបានដោយការបញ្ចូលបន្ថែមនូវរូបភាព វីដេអូ បន្ទាប់មកចាក់បង្ហាញ ទៅកាន់កូនសិស្សនៅក្នុងថ្នាក់។ ចំនែកឯកូនសិស្សវិញ ពួកគេអាចសហការជាមួយមិត្តភក្តិរបស់ ពួកគេក្នុងការបំពេញការងារ ដោយការបង្ហាញនូវភាពក្លាហានក្នុងការធ្វើបទបង្ហាញនូវអ្វីពួកគេ បានស្វែងរកជាមួយមិត្តភក្តិនៅប្រព័ន្ធអ៊ីនធឺណិត។ ចំណុចចុងក្រោយ កូនសិស្សមានឯករាជ្យភាព ក្នុងការសិក្សារៀនសូត្រដោយសារ ពួកគេអាចមើលជាវីដេអូមុនចូលរៀននៅក្នុងថ្នាក់ បន្ទាប់មក ពួកគេបានចូលរួមក្នុងការពិភាក្សារាល់ចម្ងល់ទាំងឡាយដែលពួកគេមានក្នុងវីដេអូមេរៀនជាមួយ មិត្ត និងលោកគ្រូអ្នកគ្រូនៅក្នុងថ្នាក់។

ABSTRACT

This study was conducted for two main purposes. First, it aimed to explore the teachers' perspective of ICT integration Physics subjects as the reason of using ICT in the teaching and learning. Second, it intended to determine how ICT assisted in teaching and learning Physics instruction, it would be presented. The qualitative research design was selected in this study. Purposive sampling method was used in this study. Five teacher participants were specific selected based on teaching experience and taught physics subject at Prek Leap High School, New Generation School. A Semi-structure interview technique was employed for collecting the primary data.

The analysis of the interview data revealed that: (1) all teacher participants have been motivated of using ICT applications in order to make the lesson more interesting. ICT was used to design lesson plan, slide presentation, teaching material and assessment. The most ICT applications and platforms were used such as Office applications, videos editing, online assessment platforms, virtual experiment and so on. (2) the ICT have been improved working performance of teachers and students. The teachers have saved time during preparing the lesson since every lesson have been done on the computer and could be re-used or restored later on. It could get students' attention with inserted pictures/images, and videos that are played during class. Thus, the students could work collectively with their classmates, they were brave to do presentation what they figured out from the internet. Last but not least, the students have been independent in their learning because of watching the videos outside the classroom and then they were joined in discussion what they were curious or questioned.

SUPERVISOR'S RESEARCH SUPERVISION STATEMENT

TO WHOM IT MAY CONCERN

Name of program: Master's Degree of Education in Mentoring

Name of candidate: Yun Sinot

Title of thesis: Teachers' Perspective of using ICT Applications Software in Teaching
Physics Subject

This is to certify that the research carried out for the above titled master's thesis was completed by the above-named candidate under my direct supervision. I played the following part in the preparation of this thesis: guidance in research problem development, literature review, methodology, data analysis, and discussion finding.

Supervisor (Name):

Supervisor (Sign):

Date:

CANDIDATE'S STATEMENT

TO WHOM IT MAY CONCERN

This is to certify that the thesis that I "**Yun Sinot**" hereby present entitled "Teachers' Perspectives of Using ICT Applications Software in Teaching Physics Subject"

for the degree of Master of Education major in mentoring at New Generation Pedagogical Research Center is entirely my own work and, furthermore, that it has not been used to fulfill the requirements of any other qualification in whole or in part, at this or any other University or equivalent institution.

Signed by (the candidate):

Date:

Countersigned by the Supervisor:

Date:

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TABLE OF CONTENTS

មូលនិយមសង្ខេប	i
ABSTRACT	ii
SUPERVISOR'S RESEARCH SUPERVISION STATEMENT	iii
CANDIDATE'S STATEMENT	iv
Acknowledgements	v
List of Tables	ix
List of Figures	x
List of Abbreviations	xi
CHAPTER 1: INTRODUCTION	1
1.1 Background of the Study	1
1.2 Statement of the Problem	2
1.3 Research Purposes	3
1.4 Research Objectives	3
1.5 Research Questions	3
1.6 Significance of the Study	3
1.7 Operational Definition of Key Terms	4
CHAPTER 2: LITERATURE REVIEW	5
2.1 Role of ICT in Education in General	5
2.2 Theoretical perspectives on education technology	6
2.3 Teachers' current use of ICT facilities	8
2.4 Teachers' challenges of implementing ICT	8
2.5 Summary of Literature Review	9
CHAPTER 3: RESEARCH METHODOLOGY	10
3.1 Research Design	10
3.2 Sample Size and Sampling Technique	11
3.3 Research Instrument	12
3.4 Data Collection Procedure	13
3.5 Data Analysis	13

3.6 Ethical Considerations	14
CHAPTER 4: RESULTS	16
4.1 Background Information of the Participants	16
4.2 Teachers' Perspectives of Using ICT Software Applications in Teaching	16
4.2. General Use of ICT in Daily Life	16
4.2.2 Using the Computer in Teaching Practices	17
4.2.2.1. Lesson and Teaching Materials	17
4.2.2.2. Classroom Assessment	19
4.2.3 Using ICT Applications Software, Platforms, and Tools	20
4.2.3.1. Office Applications Software	20
4.2.3.2. Online Assessment Platforms	21
4.2.3.3. Virtual Experimental Platforms	22
4.2.3.4. Video Editing Applications Software	23
4.2.3.5. Remote Support and Mind Map Application	23
4.2.4 ICT Training	23
4.2.4.1. Take Short Course	23
4.2.4.2. Training at NGS School	24
4.2.4.3. Learning Community	24
4.2.4.4. Self-Study	24
4.2.5 Teachers' Challenging of Using ICT	25
4.2.5.1. Hardware	25
4.2.5.2. Applications Software and Platforms	25
4.2.5.3. Internet Connection and Electricity	26
4.2.5.4. Language Barrier	26
4.3 ICT Assist in Teaching and Learning Perceived by Teachers	26
4.3.1 Teachers' Work Performance	26
4.3.1.1. Saving Time	26
4.3.1.2. Storage and Recovery	27
4.3.1.3. Getting Students Attention and Well-prepared	27
4.3.1.4. Reducing Misconceptions of Lesson	27
4.3.2 Students' Work Performance	28
4.3.2.1. Collective Work	28
4.3.2.2. Internet Using	28
4.3.2.3. Knowledgeable	28
4.3.2.4. Bravery and Self-directed learning	28

CHAPTER 5: DISCUSSION	30
5.1 Physics Teachers’ Perspectives of Using ICT Application Software	30
5.2 ICT Assisted Teaching and Learning as Perceived by Teachers	31
CHAPTER 6: CONCLUSION, LIMITATIONS, AND RECOMMENDATIONS	32
6.1 Conclusion	32
6.2 Recommendation for Non-NGS School	33
6.3 Limitations of the Study	34
6.4 Recommendations for Further Research	34
REFERENCES	36
APPENDICES	40
APPENDIX A: AVAILABLE URL FOR ONLINE ASSESMENT AND VIRTUAL EXPERIMENT PLATFORMS	40
APPENDIX B: INTERVIEW QUESTIONS (ENGLISH VER.)	41
APPENDIX C: INTERVIEW QUESTIONS (KHMER VER.)	44
APPENDIX D: APPROVAL LETTER	47
APPENDIX E: CONSENT FORM (KHMER VERSION)	48

List of Tables

- Table 1 Characteristics of the potential samples at Prek Leap High School
- Table 2 Participants' code, gender, age, teaching experience, and teaching level of
the participant at Prek Leap New generation school in Phnom Penh

List of Figures

Figure 1	Technology Acceptance Model	7
Figure 2	ICT applications software of using in teaching and learning at NGS	20

List of Abbreviations

CPD	Continuing Professional Development
ICT	Information and Communication Technology
IT	Information Technology
KOICA	Korea International Cooperation Agency
MoEYS	Ministry of Education, Youth and Sport
MS	Microsoft
NGS	New Generation School
PLC	Professional Learning Community
STEM	Science, Technology, Engineering and Mathematic
TAM	Technology Acceptance Model
PhET	Physics Education Technology
PEOU	Perceived Ease of Use
PU	Perceived Usefulness
URL	Uniform Resource Locator

CHAPTER 1: INTRODUCTION

1.1 Background of the Study

Nowadays, technology is constantly evolving and involving with people lifestyles. With technological advancements changing both people's lives and people's relationships within societies, education is also undergoing innovations and needed changes (Krause et al., 2017). It is widely recognized that Information and Communication Technology (ICT) would be a key driving force in all aspects of development in the next few decades, as it always has been since the information revolution. ICT is a well-known engine of growth since ICT is one of the key economic sectors as well as an enabler to increase competitiveness of other sectors in economy (KOICA, 2014). ICT is a part of modern life and is becoming increasingly important in education. The digital divide between developed and developing countries had long been a source of concern for educators.

A good teacher preparation program is essential for unlocking the full potential of ICT in education. Teachers must develop both positive attitudes and self-efficacy toward using ICT in educational settings in order to effectively implement it in the classroom (Krause et al., 2017). The Ministry of Education, Youth and Sport (MoEYS) has mentioned developing the teaching and learning qualifications within the twenty-first century skills frameworks by strengthening and increasing science subjects, STEM and foreign languages. In addition, teaching methods in scientific have been executed based on STEM approach that has involved using workshops, computers and laboratories (MoEYS, 2019).

It is significant to note that one of the fifteen initiatives in the Cambodian National Education Strategic Plans (2014-2018) and (2019-2023), which intends to prepare students for the workforce of the twenty-first century, is the reform of New

Generation Schools (NGS). Thus, the goal of NGS is: “Create a new development track within the public education system that will lead to the creation of autonomous public schools, which receive high investment linked to new standards of accountability and governance as well as professional standards for 21st Century learning.” (MoEYS, 2016, P.2).

The MoEYS has promoted of digital education by utilizing ICT as a tool for knowledge sharing in teaching and learning across the whole education sector. Giving students the ICT skills and knowledge, they need to transition into jobs in the twenty-first century (MoEYS, 2019).

1.2 Statement of the Problem

The shortage of studies on ICT integration in developing countries must be addressed in order to ensure complete integration of ICT in the school curriculum (Yusuf & Balogun, 2011). The MoEYS sets high expectations for the ICT in education policy, with aims to improve basic education quality, promote access to basic education for all, and develop a workforce that can compete in the world's knowledge-based economy (Richardson, 2008). The traditional chalk and talk method failed to solve the learner's problem, necessitating the use of ICT as a tool to improve knowledge and learning experience (Ohja, 2016).

Furthermore, if teachers are not actively involved in all stages of ICT integration into the curriculum, ICTs in schools will have little impact. As a result, the role of the teacher is essential at this point. Siswanto et al. (2022) stated that technology advancements, a diverse student group, and increasingly challenging subject matter have provided challenges for teachers. In terms of ICT use, more investment in education and training are needed to prepare teachers and provide them with the necessary skills (Krause & Eilks, 2019). ICT integration in teaching and learning process today remains a

challenging work as a part of teachers because of the lack of confidence and competence in ICT, lack of technical support and lack of accessibility to ICT resources (Agyei & Agyei, 2019).

1.3 Research Purposes

The purpose of this study is to explore the teachers' perspective of using ICT in teaching Physics subject. The second purpose of this study aims to determine how ICT assisted in teaching and learning in the classroom as perceived by teachers.

1.4 Research Objectives

The objectives of the research aim to seek answering with these objectives:

1. To explore the teachers' perspectives of ICT integration into Physics subjects
2. To determine how ICT assisted in teaching and learning Physics subject.

1.5 Research Questions

1. What are the teachers' perspectives on the integration of ICT into Physics subject?
2. How ICT assisted teaching and learning of Physics subject in the classroom as perceived by teachers?

1.6 Significance of the Study

This study applies to an upper secondary school context, and in the majority, this study is to find the teachers' perspectives of using ICT applications software in teaching physics. It advantages learners and teachers with their own experiences. Also, they would benefit by reflecting on their teaching and learning to produce the new way or techniques which are more practical to students' learning and teaching instruction. Moreover, to school that involved with this study know how the importance of using ICT in teaching especially physics subject and others, and well-prepare with new strategies planning in order to promote teaching and learning within 21st century. All activities are

to help learners' and instructors' development in classroom to make teaching and learning more effectively. However, to promote ICT integration into physics subject learning mean that to invest more for materials or resources of study in school to make sure the process of learning and teaching more understandable, fun and applicable to the real life. It is beneficial to allow students experience what they have learned and explored new things by helping from technological tools.

1.7 Operational Definition of Key Terms

“**Application Software** is a type of computer program that performs a specific personal, educational, and business function. Each application is designed to assist end-users in accomplishing a variety of tasks, which may be related to productivity, creativity, or communication.” (Quickbase, 2022)

Information and Communication Technology (ICT) are networks that deliver digital content to provide new opportunities for teaching and learning (Prytherch, 2000). ICT tools are changing process of teaching and learning by adding elements of vitality to classroom and new digital ICT is not a single technology; it is combination of hardware and software such as word processing, content creation application and spread sheets (Das, 2019).

CHAPTER 2: LITERATURE REVIEW

To achieve literature for this study, the researcher reviewed the resources both local and international. The literature of this study, they were found by reviewing the book series are related, website of Google scholar, journals, and articles that were focusing on ICT integration into science subjects in school. In this chapter focused on: first, role of ICT in education in general; following by theoretical perspectives on education technology that are related to this research study. Next, previous studies on teachers' perceptions toward ICT integration into science subjects that to review other researchers have done so far.

2.1 Role of ICT in Education in General

Since the late 1970s, there have been increasing efforts in many developed countries to introduce ICTs into schools through the provision of personal computers. The issue of 'computers in education' had been started to become popular in educational policy-making in the early 1980s, when relatively cheap microcomputers became available for the consumer market. Later, near the end of the 1980s, the term 'computers' was replaced by 'IT' (Information Technology), signifying a shift of focus from computing technology to the capacity to store and retrieve information. When e-mail started to become available to the general public, this was followed by the introduction of the term 'ICT' (information and communication technologies) about 1992. Educational innovations aimed at attaining these new skills (with the help of ICT) and at finding a new balance between old and new educational targets are needed (Pelgrum & Law, 2003).

Educational technology refers to the study and moral practice of creating, using, and managing appropriate technological processes and resources to facilitate learning and

improve performance. Educational technology styles have evolved from early uses of audiovisual aids to individual and networked computers, and now have evolved to include various mobiles and smart technologies, as well as virtual and augmented realities, avatar-based immersive environments, cloud computing, and wearable and location-aware devices (Culbertson & Howard, 2020). Furthermore, when creating assignments, communicating, collecting data and documentation, and conducting research, ICT is used as a "assisting tool". ICT replaces traditional teaching methods with modern ones and preparing teachers to use them (Bhattacharjee & Deb, 2016).

2.2 Theoretical perspectives on education technology

Technology Acceptance Model

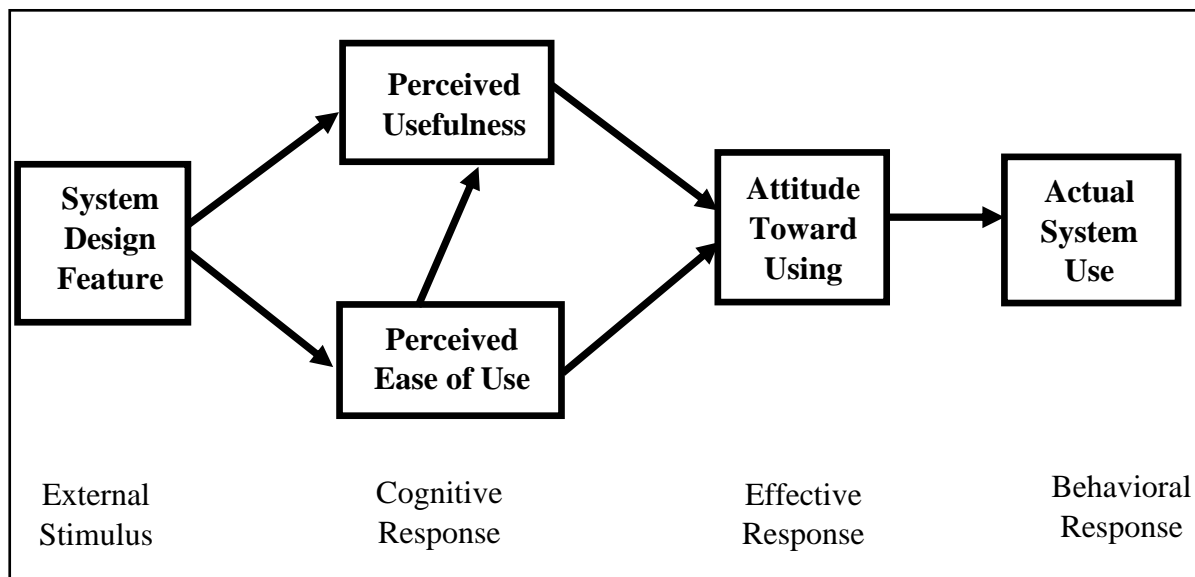


Figure 1. *Technology Acceptance Model (Davis, 1987).*

When teachers are presented with new technology, two key factors will influence their decision about how and when they will use it based on the extended variables around them. External variables are variables that are not controlled by the user. It represents the difficulties that teachers face when integrating new technology into their teaching and learning processes that are beyond their control. The following are some of the challenges: (1) Limited accessibility and network connection, (2) schools with limited

ICT facilities, (3) lack of effective training, (4) limited time, and (5) lack of teachers' competency.

Furthermore, Perceived usefulness (PU) – This is a measure of how much people believe using a certain technology would improve their job performance. Teachers are less likely to use ICT tools if they believe there is no need to question or change their professional practice. However, if they believe ICT is beneficial to their teaching and students' learning, they will use it. The following factors have identified as key elements to teachers' perceived usefulness of ICT tools such as working more quickly, job performance, increased productivity, effectiveness, and usefulness.

Additionally, Perceived Ease of Use (PEOU) – This is the degree to which people believe that using a particular system will be painless. In studies on experienced practicing ICT users, a number of factors relating to perceived ease of use of ICT have been identified. Other studies, such as the Impact project (Watson, 1993), identified a wide range of skills and competencies that teachers believed they required in order to find ICT easy to use. Here are a few examples: easy to learn, clear and understandable, easy to use, controllable, easy to remember. Next, Attitude toward use – teacher's feelings about performing the target behavior (positive or negative) (e.g., using a system). Teachers' attitudes toward many of these factors will largely be determined by how easy they perceive using ICT tools to be on a personal level as well as for classroom teaching.

Behavioral intention refers to the extent to which a teacher has made conscious plans to perform or not perform a specific future behavior. Social influence processes (subjective norm, voluntariness, and image) and cognitive instrumental processes (job relevance, output quality, result demonstrability, and perceived ease of use) as determinants of perceived usefulness and usage intentions (Marangunić & Granić, 2014).

Basically, the updated version of TAM 2 consists of additional determinants that are social influence process and cognitive instrumental processes of perceived usefulness and usage intentions (Venkatesh & Davis, 2000).

2.3 Teachers' current use of ICT facilities

In general, teachers use ICT to prepare for lessons and to deliver those lessons in class. For lesson preparation, the results show the following common pattern of ICT use. Teachers search the internet; download relevant materials; design practice activities with word processing; prepare presentations with Microsoft (MS) PowerPoint. PowerPoint presentations are popular. Wherever the internet is available, teachers use it to supplement teaching points. Word processing is also used especially for writing classes (Dang, 2011).

Mayowa et al. (2021) have investigated the science teachers' perceptions with regards to the use of computer tools and its software packages in the classroom in secondary school by using quantitative design with 322 participants who responded to the questionnaires. The results of the study revealed that science teachers in post-primary schools are incompetent at integrating computers into science lessons. This have indicated that the majority of teachers are incompetent, mean that they are unable to generate lesson notes, lesson plans, and deliver contents of lessons using ICT, but they have been very positive attitude about the use of computer technology into science subjects. Furthermore, the facilities and resources are available to support ICT integration into the school curriculum were severely lacking.

2.4 Teachers' challenges of implementing ICT

A study which focused on “analyze teachers' perceptions of the challenges faced in using ICT tools in classrooms” at Malaysia. The quantitative method design was used for data collecting from a sample of 100 secondary school teachers by survey

questionnaire. This study has indicated the key issues and challenges to significant using ICT tools by teachers were: limited accessibility and network connection, limited technical support, lack of effective training, limited time and lack of teachers' competency (Ghavifekr et al., 2016).

2.5 Summary of Literature Review

The literature review above has represented about ICT revolution and implementation into education system. In addition, TAM model is useful to find out external variables, perceived usefulness, perceived ease-of-use, attitude toward use and behavioral intention that relevant to the research. Following by the previous studies which showed several research studies to explore the teachers' perspectives toward ICT integration into physics subjects, and teachers' challenges of implementing ICT into classroom.

CHAPTER 3: RESEARCH METHODOLOGY

This chapter contains six main categories of methodology discussing outline of the study that are used in qualitative approach. The purpose of this chapter explained how research was designed, following by sample size and sampling technique. Next, research instrument that was employed in this study, following by data collection procedure that presented how data was collected from the participants, following by data analysis that would be interpreted, and ethical consideration would be concerned in this study.

3.1 Research Design

This study conducted with a qualitative approach to fulfill the research goals and address the research questions. The qualitative study used to examine groups of teachers who currently teach in science subject matter in specific physics subject. The narrative research was used in this study. The narrative research was a specific type of qualitative research design to ensure that the researcher got more detail about individual stories or experiences, for example, the teacher's motivation to integrate ICT in their teaching, what factors influenced their teaching and challenges using ICT. The researcher would like to see their own stories in teaching and learning practices in the classroom. To conduct research study in smaller site of population and are provided appropriate flexibility, we used naturalistic methods of data collection. It usually has not used standardized instruments as its primary data source, and qualitative approach is highly recommended (Kumar, 2011; Lodico, Spaulding, & Voegtler, 2010).

In qualitative research, to collect data and analysis data, the methods can be useful in data collection, there are observations, interviews and documents (Cohen et al., 2007). This study was used interview for doing data collection in order to understand the teachers' perspectives while they are implementing the ICT in teaching in physics

subject. Semi-structured interview was employed in this study. Open-ended questions were designed to fit with semi-structure interview and also follow-up questions were developed as the interview progresses based on participants responses.

3.2 Sample Size and Sampling Technique

This research selected a school in Phnom Penh called Prek Leap High School. And also, there are several reasons to taking this site as a target of study. First, this upper secondary school was a school modeling in Cambodia, New Generation school context which to target teaching practice in school. Therefore, it is interesting to find out teachers' perspectives of using ICT applications software in teaching physics subject in education characteristic that this upper secondary school presented. Secondly, there are acceptable teachers to create an enough sample size in research study. Communication was made with participants, teachers, school principal and other educational stakeholders who involved in this study.

This study, researcher conducted a small sample size of the study. To obtain this study to be achieved, purposeful sampling approach was selected. The purposeful sampling was selected participants who could best help researcher learn and understand the phenomenon of interest (Creswell, 2012). The purposeful sampling has been commonly method usage in qualitative study. This sampling is beneficial to researcher who want to explore teachers' perspectives of using ICT applications software in teaching physics subject in the classroom with target group of participants as shown in Table 1.

Moreover, five teacher participants among of seven who were currently teaching in physics subject were selected as sample size. Furthermore, researcher was careful selecting participants based on their sex, teaching level, number of teaching experience, and subject matter who are be able familiar with this study.

Table 1. *Characteristics of the potential samples at Prek Leap High School*

Teaching level	Sex	Number of teaching experience	Subject matter
7 – 12	Females Males	More than 3 years	Physics

Note. Five participants were selected to participate in this study

3.3 Research Instrument

This study employed a qualitative design and conducted in-depth interviews with chosen participants. The purpose of interview has been found out what come up in people mind, and what about their thought or how they sense toward something (Fraenkel et al., 2012). Similarly, Kvale (1996, p. 14, as cited in Cohen et al., 2007) quoted that “as an interview, an interchange of views between two or more people on a topic of mutual interest, sees the centrality of human interaction for knowledge production, and emphasizes the social situatedness of research data”.

Semi-structured interview played role in interviewing and was not required with the sequence of the questions with participants (Fraenkel et al., 2012). Semi-structured in-depth interview have been mostly used to find the teachers’ perspectives of using ICT in their teaching with an individual thought. In common, researcher conducted once for an individual participant and took between thirty minutes to forty-five minutes for interview based on the interesting answers of participants. To make more secure data collection, the researcher designed the interview questions to get with the general information (biographical information) such as gender, age, background of their study was collected in order to access the teachers’ perspectives of their teaching experiences. The interview protocol allowed the researcher to elicit information, opinion and belief from participants. The interview questions were developed based on the theoretical perspective of Technology Acceptance Model of literature. In addition, every participant would been

familiar with questions and be able to answer the questions in the easy mode and interviewer would not pressure them.

3.4 Data Collection Procedure

The researcher asked for the permission from the participants or stakeholders by sending the approval letter to school principal, and then sent consent forms to invite and inform each participant to show the purpose of this study and how data was used only study purpose and keep it for confidential. The interviewer set up random schedule based on the interviewees' availability. Moreover, the interview was done online via Zoom platform and flexibilities based on participants feel convenient to do so and also interviews have involved unstructured and commonly open-ended questions that were intended to elicit views and opinions from the participants. Furthermore, before starting interview, the interviewer asked permission from participants to record with audio voice or videos in order to avoid missing some important information during the interview process. However, interviewer needed to use notebook to take note some important data which helps interviewer more confident to keep tracking with interviewees.

3.5 Data Analysis

This section was reported the data that would be obtained, analyzed, interpreted and reported which adopt to give more reliability, validity, and objectivity to the finding and describe the result. To achieve the research purposefully, researcher needed to collect text or words by interviewing participants that are helpful in data analysis process. The data analysis also has involved analyzing participants information, and employed generally analysis steps as well as those steps have found within a specific design. Furthermore, in every single step of data was organized and prepared; coding the data;

improving from the codes a description and thematic analysis and interpreting the findings (Creswell, 2014).

To ensure data analysis is accurate; first researcher must acknowledge that all the information that has been collected from all participants was related to teachers' perception of using ICT software application in teaching Physics subject are recorded, organized and transcribed with different sources of information. Secondly, the researcher read the data several times to make general sense of the information and jotted it down to have some ideas that came to mind. Third, the researcher comprehended analysis with the label of data relevant keywords, phrases or sentences, coding data process that could answer to the questions. Coding data was the procedure of segmenting and labeling text to form descriptions and comprehensive themes in data (Creswell, 2012). Code represented different topics and created much as possible, and then make sure that the researcher was reduced to smaller number of codes. After the result appeared with the similar coding, the researcher was locked into the themes. Next, the researcher used the coding procedure to generate description data for analysis based on different themes. In the qualitative method, descriptions have been detailed rendering of people and could take experience and practiced to describe the detail in a setting (Creswell, 2012).

Additionally, the researcher analyzed data by hand or manually in the word processing software. The manual analysis of qualitative data refers to the researcher reading the data, spotting it by hand, and dividing it into parts (Creswell, 2012). In addition, manual analysis could enable the researcher to be closed to the data and have a hands-on feel for it. The researcher extended the analysis to improve themes or categories that were useful to interpret data meaning into data finding results.

3.6 Ethical Considerations

To achieve the study, ethical considerations have been defined. The researcher in this study got formal approval and official permission from the school manager of New Generation Pedagogical Research Center, school principals, teacher participants and other educational stakeholders before conducting this study. The researcher informed the participant individually to read the consent forms while conducting the data collection procedure. In addition, the participants were informed to know the purpose and process of this study in order to be done and well-prepared. Furthermore, the researcher gave respect to the participants with the suitable time to complete the interview. Individual participants were possibly right to reject the interview or feel uncomfortable with the questions. Nevertheless, the researcher was careful to respect the participants' background, genders, ages, educational level of participants and experiences. Finally, the researcher kept all the participants' names anonymous and confidential. All the names of participants were replaced with letters or code numbers instead.

CHAPTER 4: RESULTS

This chapter reports the results obtained from the qualitative phase of the study.

The results are organized into three parts; part one presents the demographic information of participants; part two reports teachers' perspectives of using ICT software applications in teaching; and part three shows how ICT assists teaching and learning in the classroom.

4.1 Background Information of the Participants

Table 2

Participants' code, gender, age, teaching experience, and teaching level of the participant at Prek Leap New generation school in Phnom Penh

Codes	Sex	Age	Teaching experience	Teaching at NGS	Teaching level
T1	F	28	6	5	7, 12
T2	F	35	12	2	7, 11
T3	M	35	8	3	8, 10
T4	M	36	12	4	11, 12
T5	M	30	6	5	11, 12

Note. The five participants were involved in this study. Two among them are female teachers, and three participants are male teachers.

The age of T1 is the youngest one when compared to others. However, T1 has the same teaching experience in regular school and NGS as T5. Furthermore, T2 and T4 have a year gap in age and have the same teaching experience in public school, but joining NGS school in different teaching experiences. The last participant, T3, is the same age as T2, but teaching experiences in public school and NGS are different. T2 mentioned that in NGS, they are required to teach both lower secondary and upper secondary school classes.

4.2 Teachers' Perspectives of Using ICT Software Applications in Teaching

4.2.1 General Use of ICT in Daily Life

All teacher participants were asked to describe their personal life in terms of ICT use in daily life. All of them mostly used the internet and smartphones every day. They used it for entertainment, news, connecting with colleagues, students, and students' guardians and so on. The mobile applications that they mostly used were Facebook, YouTube, Telegram and Messenger. T1 and T2 mentioned Zoom meeting when the Covid-19 pandemic was spreading in Cambodia, the teaching was moved to online classrooms. In addition, T1 and T3 mentioned Google search engine, but T1 did not mention what she researched about while T3 searched about pictures related to the lesson which were important to show to the students in the classroom.

T5 often used Gmail after Telegram. Specifically, TS shared his experience of using Facebook to promote his work such as teaching methodologies, documents, work experiences and so on to social media. Additionally, T5 had a personal YouTube channel, so he could upload teaching videos into his personal channel and share them.

4.2.2 Using the Computer in Teaching Practices

4.2.2.1 Lesson and Teaching Materials

The participants were asked to describe their different perspectives of using ICT in their teaching practices in the classroom. All participants (T1, T2, T3, T4, T5) use computers to produce lessons or teaching materials in their classrooms. All of them use their computers to prepare their teaching materials before class, such as making lesson plans, presentations slides, inserting images/pictures, showing videos, preparing experiment materials, and doing the paper-based and online assessment. T1 claimed that “most of the working, we work on the computers, whether it is administrative work, the content of the lesson, lesson plans, slides, and other works we use the computers”.

a. Lesson plan

All participants state that lesson plans must be presented before class because teachers must be prepared for the learning objectives, activities, teaching materials or instruction to ensure the lesson leads to students' learning outcomes. T1 and T2 have expressed that the lesson preparation depends on whether the lesson is existing or new. It would take a short time if it already existed. It took more than two to three hours to complete when it came to doing new ones. Every lesson needs to plan in-depth about the contents, teaching methodology, and time control with steps flow. T2 also mentioned how she has tried to practice or read it several times to ensure it goes smoothly.

b. Slide(s)

All the participants mentioned the presentation slides of the lesson that teachers should complete with slides for each content of the lesson and whether it is possible to use LCD projector in their classroom or not.

c. Image(s) and Video(s)

Most participants mentioned images and videos were included in their classroom content. All those images and videos were found on the internet to ensure contents are strongly completed in order to transfer to the students.

d. Experiment Materials

All teacher participants developed the experiment materials used in the lab during class individually and collectively. T1 and T2 expressed handouts to give to the students during the experiment. T1 provided the evidence that handouts must be provided to each group of students in order to facilitate them in the group. T1 also gave more extra question papers to each group to discuss the lesson if the LCD projector had not worked well.

e. Scores Entry

In the interview, all participants answered different points of view on using ICT. Two among five teacher participants (T1 and T2) mentioned scoring management system at school. It is kind of web-based platform was used in NGS school.

4.2.2.2. Classroom Assessment

a. Quiz

Participants were asked to describe how they assessed or evaluated their students' abilities after classes ended. All participants showed that they spent five to ten minutes doing a quiz to assess students' abilities. The quiz is separated into two parts: first, before starting the lessons, and the last one, in step four of the evaluation activity in the lesson plan. All participants experienced designing their test using ICT applications software and then printing it out for their students. They expressed that this was a possible way to do it, took a short time, and could use in a physical classroom.

b. Exercise(s)

Some participants (T1, T2, and T5) designed the assessment by doing exercises after class ended. They mentioned using slides to show their exercises to the students and letting them do the exercises individually. Sometimes, students were randomly selected to demonstrate their answers on the whiteboard. T5 explained that since this year, he had taught grade twelve, which focused on Bac II exam. He mostly used this technique to ensure students understood and practiced with exercises.

c. Online Platform

Most participants (T1, T2, T4, T5) described about how they conducted their assessments using online platforms. The online platforms that participants mainly used were Quizizz and Google Form. Participants mentioned switching between paper-work

and online platforms to ensure making assessment fun. T1 also said her online classroom during the Covid-19 pandemic in Cambodia; most of the assessment was done by the Google Form platform. However, when school reopened, the Google Form platform did not use anymore because it was not fun in the classroom. So, T1 and T2 used the Quizizz platform in order to make the classroom active and enjoyable during physical classes. T2 added more about her classroom assessment to review previous lessons with many exercises that paper works or handouts have not been done. She switched to Quizizz in case she wanted her students to review the formulas, contents of the lesson, and theories.

4.2.3 Using ICT Applications Software, Platforms, and Tools

The participants were asked to describe ICT applications software, and platforms they used mainly in their teaching practices.

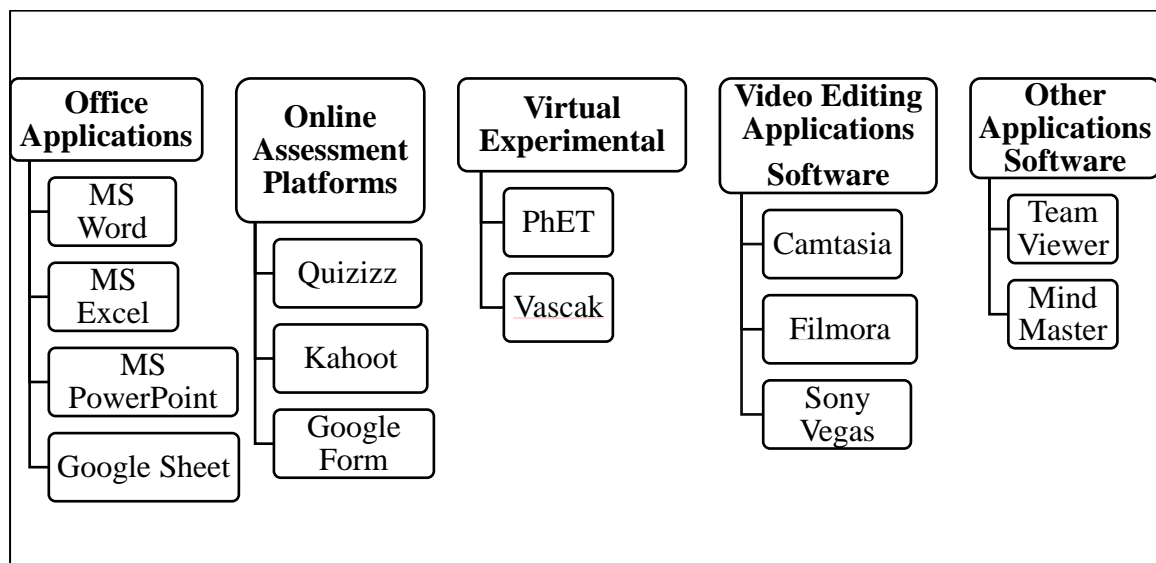


Figure 2. *ICT applications software and platforms of using in teaching and learning at NGS*

Note. The URLs were provided of applications software and online platforms. Please go to Appendix A

4.2.3.1. Office Applications Software

a. Word Processing

Participants (T1, T2, T3, T4, and T5) explained that their teaching materials were designed using Microsoft Word. They used them to create lesson plans and mentioned that they had never used other applications to produce them. T1 added more about creating questions, tests, quizzes, and assessment papers using Microsoft Word in her teaching practices.

b. Spreadsheet

Three teacher participants among five teacher participants who participated in this study provided different points of view regarding the term of use; T1, T2, and T3 defined Microsoft Excel. T1 and T3 used Microsoft Excel to calculate the scores of students for each session in the classroom. In addition, they added creating the name lists of students, inserting tables, and other lists for buying some necessary equipment used in the classroom, especially in the early academic year. Besides, T2 mentioned using Microsoft Excel in teaching but did not express what she used it for.

Google sheet was expressed by T5. The teacher participant mentioned that Google sheets was used to insert the table when online teaching was applied.

c. Content Creation

All participants were asked to describe how to use Microsoft PowerPoint in their teaching practices in the classroom. All participants used to create slide presentations. All of them mentioned that they created slide presentations by including the content of lessons, pictures, videos, and links from the internet to make sure the lessons were interesting and meaningful.

4.2.3.2. Online Assessment Platforms

In terms of the preparation of physics subject using the ICT applications software, all teacher participants agreed that assessment could not always work with paper-work,

oral test or doing exercises on the whiteboard but online platforms could help. It motivated students' learning, made some fun and gained more knowledge. For online assessment platforms, participants preferred Quizizz rather than Kahoot. They mentioned Quizizz was available on the smartphone that students could share with classmates, while Kahoot needed two devices that the teacher required to slide show for everyone in the classroom. Another platform was Google Form, used for online teaching during Covid-19 severe cases in Cambodia, and all assessments moved to online.

For Quizizz, in a class I use in average once a week and we switch to write on a piece of paper once to avoid duplication and keep changing the classroom environment.

Sometimes we open up the slide, we show it on the slide and let the students hands up and tick. We change the learning environment. Yes, they are interested in studying, they want to study, (yes) they are not sleepy, not stressed, (yes) they like to study in our subject.

(T4)

4.2.3.3. Virtual Experimental Platforms

In the interviews, the teacher participants were asked to express their view of using ICT to assist in teaching Physics. Actually, physics is one of the other science subjects that was needed involving experiments. Five teacher participants described the platforms they used to explain the virtual experimental platform to students. There are PhET and Vascak that could be used in Web Browser. T5 mostly ran the PhET platform with the Mozilla Firefox browser, while others did not mention anything. Furthermore, T3 claimed that Vascak was available in App Store and Play Store for the smartphone.

Sometimes, if the explanation is related to the phenomenon, we can use the website because some websites, such as Vascak and PhET are free. PhET is a free website, and Vascak is also a free website. Only two of them are used to have a clear image, er ... the

material is like realia, especially Vascak. For me, I mostly use er...Vascak, it showed a good result. (T4)

4.2.3.4. Video Editing Applications Software

Some of participants shared (T4 and T5) their experience of using video editing software applications in order to create video lesson and post it to YouTube channel. T5 told that he has his own channel in YouTube and used to post video lessons on this channel. However, T5 did not mention which video editing applications software were used for editing video.

Additionally, T4 experienced using the applications software for video editing with Camtasia and Filmora to record the copyright of video on the internet that was difficult to download. T4 shared the different of these two applications that was about Filmora was used in Limon for Khmer typing in the videos meanwhile Camtasia was used in Khmer Unicode form. He preferred Camtasia rather than Filmora. Another application that he shared; it was Sony Vegas.

4.2.3.5. Remote Support and Mind Map Application

T2 stated the “Team Viewer” was a remote tool that solved problems via online when using internet connection and also decreased meeting in-person. It was helpful due to problem solve successfully.

Besides, T4 mentioned about “Mind Master” application software which was used for designing concept map or mind map. It was easy to draw with different format shapes and linked automatically without manual lining.

4.2.4 ICT Training

4.2.4.1. Take Short Course

Some of participants (T1, T2, T3 and T4) shared experiences with their learning and using of ICT software applications by taking short course before joining at NGS. T1 and T3 took short course of basic computer of using Office applications (Word, Excel and PowerPoint) during starting at university and regional teacher training center. T1 also mentioned about buying a computer for practicing and it was helpful during part-time job to find and make any resources. Similar to T2 shared about taking short course of basic computer related to Office application when she was young, but did not specify the period of time.

4.2.4.2. Training at NGS School

Participants were asked to express about school training after joining at NGS context. All participants stated that at NGS context were trained all new staffs about one week for basic using ICT in teaching and learning especially, Microsoft Office. T2 added more training about online assessment.

4.2.4.3. Learning Community

The learning community was played important role in teaching and learning. T2 and T3 mentioned about learning community in NGS context, for Physics subject was looked the schedule on Wednesday afternoon at 3:00 to 5:00pm for meeting in as a team. T2 claimed that everyone in a team were rarely missed in the meeting. The team shared with virtual experiment tools, creating online assessment such as Quizizz. The Professional Learning Community (PLC) were active every day to assist members in group when members had a problem, dropped in the chat box, problem would be solved immediately. Similarly, T3 shared that using ICT leaned from colleagues who were mostly expert would be shared to others and everyone in team learned more effectively.

4.2.4.4. Self-Study

T4 and T5 shared the experience of self-study by themselves after taking course. T4 claimed that he bought a computer to practices by himself. T4 kept learning to format books, lesson plan and so forth in order to make it fluently. Sometimes, he explored on internet such as YouTube website to assist as learning materials by saved link for using later.

4.2.5 Teachers' Challenging of Using ICT

4.2.5.1. Hardware

One among five teacher participants, T1 experienced broken computer hardware around one week that was difficult in teaching and learning in the classroom. She needed to write a lot on the whiteboard and sometimes, required to research on the internet to get more information to fulfill the meaning of contents.

4.2.5.2. Applications Software and Platforms

Participants shared of different challenges of using ICT in teaching and learning. T1 and T2 experienced of putting animation in PowerPoint when they made presentation slides, copyright images' background and took time to research more. And also, T1 had problem with break pages in Microsoft Word because she had no used it long time.

Furthermore, T2 shared of expiring license or out-of-date of software applications that indicated those software applications could not work well. In addition, T2 mentioned Quizizz platform by editing of other worksheets. Before she copied from others and shared directly to students without editing anymore. After self-research for a while, she found out the option to edit.

Additionally, T4 mentioned about function of applications software that up-to-date every year. He gave example of Sony Vegas application which was new updated from version of his currently used. He found out that some functions could not find.

4.2.5.3. Internet Connection and Electricity

T5 mentioned internet connect was a challenge in teaching because everything was well-prepared with link of videos to show to the students. Unfortunately, the internet was disconnected, so the links of video could not display. One more thing, he added with electricity was cut off that mean the LCD projector could not use anymore.

Sometimes, I got a problem with the internet connection when I have prepared link videos to display in the classroom. At that time, I did not download the videos and the internet connection cut off, so it had nothing to show off. (T5)

4.2.5.4. Language Barrier

T4 used to train with Singaporean teacher who taught about writing QR Code and Robotic program with Arduino coding. It was quite different from Khmer language because of all program/coding display in English language. He had the language barrier which made T4 quite difficult to understand it and was lack of practices himself.

I am difficult to understand English because I do not know much about the English language. Personally, I have not practiced much in Lab because my age is getting old and I have my own family, so I spent less time practicing it. (T3)

4.3 ICT Assist in Teaching and Learning Perceived by Teachers

4.3.1 Teachers' Work Performance

All participants were asked to describe how ICT assisted in their teaching and learning performance. They came up with different perspectives point of views of using ICT in their work performance.

4.3.1.1. Saving Time

Four among of five teacher participants (T1, T2, T3, and T4) mentioned about using ICT to save time during their work. T1 and T2 stated that when using ICT, it helped their work faster while writing lesson plan. They also mentioned the similar content of lessons that they could use option copy and paste, and edited some words in order to complete the lesson plan in a short of time. T1 and T3 expressed that teachers could take lesson plan from other teachers who taught the same grade or level, and then edited or designed more activities on the soft based on their own students' context.

4.3.1.2. Storage and Recovery

T2 and T3 said T2 and T3 said the ICT helped their work better than before, they could save their work longer after their first writing lesson plan or contents. T2 added that if we know only the title of the document) we can find it out immediately instead of using handouts or hard copies that we need to manually seek out.

4.3.1.3. Getting Students Attention and Well-prepared

T2 shared her perspective of using ICT in the classroom about using slides presentation which made her lesson more interesting or attractive to the students learning such as online tests. Sometimes, T2 included the videos in the slides which made the students more understanding of the lesson well. Similar to T4 also mentioned slide and projector use for teaching that teacher needed to be well-prepared before class. For example, when the internet had a problem, as a teacher needed to download videos or any applications software to play or show to the students that made them understand more.

4.3.1.4. Reducing Misconceptions of Lesson

T5 explained more of using ICT to support his teaching more effectively. He compared the teaching in the past and now. As before, no slide use, no videos and no pictures which led students to misconception based on lecturing. Now, using ICT helped

the teaching and learning go smoothly. That meant the lessons were not very abstract and their learning more knowledgeable.

4.3.2 Students' Work Performance

4.3.2.1. Collective Work

The participants were asked how the students learned while teachers integrated ICT into the classroom. T1 shared her class activities in the classroom that students could work collectively. Based on the contents of the lessons, she mentioned that students shared ideas with other members and could explore on the internet.

4.3.2.2. Internet Using

T3 mentioned about homework, he noticed that his students completed it well. Beside this, the students could use the internet to help and find out the answer based on the task.

4.3.2.3. Knowledgeable

T2 mentioned the way that students got knowledge when ICT was integrated. in the classroom. The videos made students well-understand about content and concept. In addition, the students could practice many exercises and formulas at the same time and take a short time when compared to hand-writing.

4.3.2.4. Bravery and Self-directed learning

In New Generation School, the students' learning was working well, they were motivated in their learning and they were also brave enough to answer the teacher's questions and do the presentation. They could explain well what they found out and shared to teacher and classmates.

The students performed better in their learning because the students can go back and forth many times in a video in case, they do not understand the lesson.

CHAPTER 5: DISCUSSION

The chapter discusses the two major findings in relation to the existing literature review. Section 5.1 Physics teachers' perspectives of using ICT applications software in teaching physics. Section 5.2 focuses on how ICT assisted teaching and learning perceived by teacher.

5.1 Physics Teachers' Perspectives of Using ICT Application Software

Drawn from the analysis of the interview data, the findings show that five teacher whom selected to be participants of the study were used ICT in their classroom. The all-teacher participants using their computer to produce lesson and teaching materials. In addition, online assessment platforms were used to assess the students' performance after their learning. This finding is consistent with previous study (Dang, 2011) stated teachers followed the common pattern of ICT use for preparation of the lesson by using internet, downloaded relevant materials, design practice activities with word processing and slide presentation.

However, Mayowa et al. (2021) stated differently from the findings about incompetent of integration computers into science lessons. The research indicated that the majority of teachers are incompetent, mean that they are unable to generate lesson notes, lesson plans, and deliver contents of lessons using ICT, but they have been very positive attitude about the use of computer technology.

When the participants were asked to describe about experimental in Physics subject, all of them mentioned about interactive experimental stimulation of PhET and Vascak which helped teaching and learning more interact between teachers and students. This finding indicated that students would not image about the process of experiment anymore if physic experiment have not been done. Similarly, Finkelstein et al. (2006) have compared effectiveness of PhET simulations to educational resources used in

introductory physics subject. The study found that simulations are more productive in each case than reading materials or chalk-talk lectures. The simulations: enable a participatory method, use dynamic feedback, adopt a constructivist methodology, offer a creative workspace, make obscure models or phenomena apparent, and productively restrain learners.

5.2 ICT Assisted Teaching and Learning as Perceived by Teachers

The results in this section answered the research question about the major of ICT assisted in teaching and learning in physics subject. The analysis of the interview data reveals that the using ICT have improved teachers' and students' performance. Teachers were saved time for their lesson planning. It could be stored and able to use later. Some participants mentioned about finding the data faster.

This finding is consistent with TAM (Davis, 1987) perceived usefulness that measure of using a certain technology would improve their job performance. The teacher believe ICT is beneficial to their teaching and students' learning and also work more quickly, job performance, and increased productivity.

CHAPTER 6: CONCLUSION, LIMITATIONS, AND RECOMMENDATIONS

6.1 Conclusion

To answer the two main research questions, the qualitative research study was employed in the study. The data were gathered from the five teacher participants by using semi-structured interviews. The major findings of this study were summarized as follows.

Teachers' perspectives of using ICT application in their teaching in the classroom that they have been used. The result of this study indicated that most of the teacher participants used ICT application to produce their lesson and teaching materials such as lesson planning, presentation slides, quiz and exercises (physical and online assessment). Based on the hard work of teachers, it was shown that it was helpful to learning outcomes of the students more effectively. Because the students did not imagine anymore, they also did not learn by heart, but they could discover or self-study by doing experiments with the teacher facilitating. When they did it by themselves, they were surprised to see how the experiment worked with the result. It was better to save much time when teachers used slides in the classroom rather than board-writing due to no results or outcomes after finishing the lesson. Teacher could get students' attention better by putting slides animation, pictures, videos rather than only lecturing.

Additionally, teachers created the video lessons, so they could use flipped classroom in order to share with students watching outside school. The students could watch it to gain some ideas from pictures, formulas, and also theories before class. Besides, during class the students did not need to spend much time to take notes or write the whole lesson, but together the teacher and students took much time to discuss about the lesson, asking questions what they were curious about the videos and also doing the exercises. This way the students could learning better.

6.2 Recommendation for Non-NGS School

In Cambodia, NGS schools serve as a model for other public schools. To create ongoing improvements to the educational services provided in multiple areas such as the classroom environment, the library, the counseling services, the science and ICT labs, and other places.

This study would recommend to school and teachers at non-NGS schools would pay attention to leaning outcome of students.

- The school should have additional budget plan for ICT equipment, at least one LCD projector per room to allow the teachers use during class. It is kind of motivation to let teacher and students experience with the new thing. Science teachers may need to show new thing to the students by physical experiment. However, because of shorten experiment material, using videos or virtual experiment would be helped students' learning better.
- The school should propose the training course to encourage teachers enrolling. It is a part of Continuing Professional Development (CPD) and also encourage teacher with PLC weekly or monthly.
- The school should allow teachers to have study tour to NGS schools, to know the strategies, techniques or new things that teachers at NGS implement in the classroom successfully.
- The teachers should transform themselves to new revolution that mean to step up the ICT revolution in education by integration ICT with their teaching and learning by starting basic applications software such as Office Applications make lesson plan, design teaching materials and presentation slides to ensure the students can achieve the learning goal.

- The teachers should discuss with other teachers who are the same subject matter in order to find new ideas or sharing teaching materials for example CPL. It would be helpful if all teachers are involved.

6.3 Limitations of the Study

This study was adopted qualitative research methodology, using semi-structured interviews as the main data collection tool. Only physics teachers from a New Generation School in Phnom Penh were included in the preliminary descriptive analysis. Therefore, the information and data were not able to be used to apply broadly because the study drew only on a small group of students who participated in this research. They are from NGS context, especially physics teachers. It may not represent fully to population site of the study and/or other New Generation Schools' context. This study did not select many participants because of no available time of the participants and time constraints.

In addition, the interview protocol was the primary tool used by the researcher. As a result, the findings could not be supported statistically. If a different research methodology had been used to validate the participants' perspectives, the results might have been different.

Last but not least, the researcher did not ask the process how physics teachers have been taught in the classroom. So, this study could not be assumption which teaching methods teachers would use.

6.4 Recommendations for Further Research

Based on the find and insight gained from this study, the following recommendations for further research are made:

1. It is recommended that further research should be conducted with bigger sample size to ensure that the result is represented to all New Generation Schools.

2. It is recommended that researcher should figure out both teachers' and students' perspectives of using ICT in the classroom. And also, it should be mixed with teaching methodology.

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APPENDICES

APPENDIX A: AVAILABLE URL FOR ONLINE ASSESMENT AND VIRTUAL EXPERIMENT PLATFORMS

1. Google form: Require to sign up with gmail. <https://docs.google.com/forms/u/0/>
2. Google Sheet: Require to sign up with gmail.
<https://docs.google.com/spreadsheets/u/0/>
3. Kahoot: Require to sign up any email as Teacher if you want to create your own test. <https://create.kahoot.it/auth/register/user-type?deviceId=PEFbDdfcPuub-SucHyYnBd&sessionId=1675573550415>
4. Mind Master: Require to sign up to get full features. <https://www.mindmaster.io/>
5. PhET: the original name “Physic Education Technology” is a Free online interactive science and math simulations developed by students and educators at the University of Colorado. As users interact with these tools, they get immediate feedback about the effect of the changes they made. It is available for Chemistry, Physics, Mathematics, Biology and Earth Science.
<https://phet.colorado.edu/>
6. Quizziz: Require to sign up any email as Teacher if you want to create your own test. https://quizziz.com/signup?source=sch_header
7. TeamViewer: Available in any Operating System software and smartphones.
Download link: <https://www.teamviewer.com/en/download/windows/>
8. Vascak: it is similar to PhET and available only Physics subject and can download from Play Store and App Store. <https://www.vascak.cz/physicsanimations.php>

APPENDIX B: INTERVIEW QUESTIONS (ENGLISH VER.)



NEW GENERATION PEDAGOGICAL RESEARCH CENTER

Topic: Teachers' Perspectives of Using ICT Software Applications in Teaching Physic Subject

Supervisee: Ms. Yun Sinot

Supervisor: Mr. Chi Kim Y

Interview Questions

I. Demographic information

1. How old are you?
2. How many years have you been teaching?
3. Which grade are you teaching currently?
4. What subjects do you teach currently?

II. What are the teachers' perspectives on the integration of ICT into science subjects?

a. Perceived usefulness

1. How do you prepare the lesson for your teaching?
2. What kind of lessons/materials do you prepare per session?
 - Slides?
 - Lesson plan?
 - Exit ticket?
 - Quiz or questions?

- Others?
3. How do you produce your teaching materials?
 4. Have you ever used the internet to produce your lessons? How do you use it to find out the information?
 5. How much time do you spend preparing your lesson/materials?
 6. Do you think ICT have increased your productivity? Why or why not?
 7. Do you think ICT improves your work performance? Why or why not?

b. Perceived ease of use

8. What software applications have you regularly used in your teaching?
 - Word processing
 - Spreadsheet
 - Quizizz
 - Kahoot
 - Content creation
 - Google products
 - Others
9. How do you learn those applications? By yourself/colleagues/training?
10. Do you think it works well for you? Why or why not?
11. Do you find out any challenges of using those software applications? What are they?

III. How ICT assisted teaching and learning of science subjects in the classroom as perceived by teachers?

12. Have you ever created/designed any games for your class? How was it going?
13. How often do you play games with your students in the classroom?
14. Do your students involve well with your games? Why or Why not?

15. What are the ways in which teaching and learning with ICT impact on student learning?
16. How do you extract the complex lesson for your students?
17. In what ways do help your students with ICT tools (e.g., computer, smart phone, ...)?

APPENDIX C: INTERVIEW QUESTIONS (KHMER VER.)



NEW GENERATION PEDAGOGICAL RESEARCH CENTER

**ប្រធានបទ: ការយល់ឃើញរបស់គ្រូទៅលើការប្រើប្រាស់កម្មវិធីICTក្នុងការ
បង្រៀនមុខវិជ្ជារូបវិទ្យា**

**Teachers' Perception of Using ICT Software Applications in Teaching
Physic Subject**

អ្នកស្រាវជ្រាវ: យុន ស៊ីណូត

សាស្ត្រាចារ្យជំនាញ: ជា គីមអ៊ុ

កម្រងសំណួរសំភាសន៍

Opening

នាងខ្ញុំឈ្មោះ យុន ស៊ីណូត គឺជាគរុសិស្សកំពុងសិក្សាថ្នាក់បរិញ្ញាបត្រជាន់ខ្ពស់ ឯកទេសប្រឹក្សាគរុកោសល្យ នៅមជ្ឈមណ្ឌលស្រាវជ្រាវគរុកោសល្យជំនាន់ថ្មីនៃវិទ្យាស្ថានជាតិអប់រំ ។ នាងខ្ញុំបាននឹងកំពុងធ្វើការស្រាវជ្រាវលើប្រធានបទ “ការយល់ឃើញរបស់គ្រូទៅលើការប្រើប្រាស់កម្មវិធីICTក្នុងការបង្រៀនមុខវិជ្ជារូបវិទ្យា” ដែលនេះគឺជាការសរសេរសារណាខ្លីមួយ សម្រាប់បញ្ចប់ការសិក្សាថ្នាក់អនុបណ្ឌិតផងដែរ របស់នាងខ្ញុំ។

សូមអរគុណលោកគ្រូ/អ្នកគ្រូសម្រាប់ការចំណាយពេលដ៏មានតម្លៃក្នុងការចូលរួមក្នុងបទសំភាសន៍នេះ។ ខ្ញុំសូមបញ្ជាក់ថា ព័ត៌មានដែលប្រមូលបានពីលោកគ្រូ/អ្នកគ្រូត្រូវបានរក្សាជាការសម្ងាត់។ លោកគ្រូអ្នកគ្រូមានសិទ្ធិមិនឆ្លើយសំណួរណាមួយ ឬបញ្ចប់ការឆ្លើយសំណួរនៅត្រង់ចំណុចណាមួយក៏បាន។

IV. ព័ត៌មានផ្ទាល់ខ្លួន

- 5. សូមលោកគ្រូ/អ្នកគ្រូណែនាំខ្លួន (ឧទាហរណ៍៖ អាយុ បទពិសោធន៍បង្រៀន មុខវិជ្ជា និងកម្រិតថ្នាក់) ?
- 6. តើលោកគ្រូ/អ្នកគ្រូកំពុងប្រើប្រាស់កុំព្យូទ័រ ទូរស័ព្ទទំនើប និងអ៊ីនធឺណិតក្នុងជីវភាពប្រចាំថ្ងៃដែរឬទេ ?
- 7. ជាធម្មតា តើលោកគ្រូ/អ្នកគ្រូប្រើប្រាស់កុំព្យូទ័រ ទូរស័ព្ទទំនើប និងអ៊ីនធឺណិតសម្រាប់ធ្វើអ្វីខ្លះ ? តើរយៈពេលយូរប៉ុន្មានដែលលោកគ្រូ/អ្នកគ្រូប្រើប្រាស់ឧបករណ៍ទាំងនោះក្នុងមួយថ្ងៃ ?
- 8. ជាបទពិសោធន៍ផ្ទាល់ខ្លួនរបស់លោកគ្រូ/អ្នកគ្រូ តើឧបករណ៍ទាំងនោះមានអត្ថប្រយោជន៍យ៉ាងដូចម្តេច ?

V. សំណួរគន្លឹះ

សំណួរគន្លឹះទី១៖ តើលោកគ្រូ/អ្នកគ្រូយល់ឃើញយ៉ាងដូចម្តេចចំពោះការបញ្ចូលICTទៅក្នុងការបង្រៀនមុខវិជ្ជារូបវិទ្យា ?

- 9. តើលោកគ្រូ/អ្នកគ្រូរៀបចំសម្ភារឧបទ្វេសសម្រាប់ការបង្រៀនយ៉ាងដូចម្តេច ? តើប្រភេទនៃមេរៀនឬសម្ភារឧបទ្វេណាខ្លះដែលលោកគ្រូ/អ្នកគ្រូរៀបចំការបង្រៀនម្តងៗ (ឧទាហរណ៍៖ ស្លាយ កិច្ចតែងការបង្រៀន ក្រដាសវាយតម្លៃ សំណួរខ្លីៗ -ល-) ?
- 10. តើកម្មវិធីICTណាខ្លះដែលលោកគ្រូ/អ្នកគ្រូប្រើប្រាស់ជាទៀងទាត់ក្នុងការបង្រៀន ?
- 11. តើលោកគ្រូ/អ្នកគ្រូធ្លាប់ស្វែងរកឯកសារអ៊ីនធឺណិតដើម្បីគាំទ្រការបង្រៀនដែរឬទេ ? ជាធម្មតា តើដែលលោកគ្រូ/អ្នកគ្រូចំណាយរយៈពេលយូរប៉ុណ្ណាក្នុងការរៀបចំសម្ភារឧបទ្វេស ?
- 12. តើលោកគ្រូ/អ្នកគ្រូសិក្សាអំពីកម្មវិធីICTទាំងអស់នោះដោយរបៀបណា(ឧទាហរណ៍៖ រៀនដោយខ្លួនឯង តាមរយៈមិត្តរួមការងារ ឬការបណ្តុះបណ្តាល) ?
- 13. តើលោកគ្រូ/អ្នកគ្រូមានជួបបញ្ហាប្រឈមដែរឬទេក្នុងសិក្សា និងអនុវត្តន៍កម្មវិធីICTទាំងអស់នោះ ?

សំណួរគន្លឹះទី២៖ តើICT បានជួយសម្រួលអ្វីខ្លះក្នុងការបង្រៀន និងរៀនក្នុងបង្រៀនមុខវិជ្ជារូបវិទ្យា តាមយល់ឃើញរបស់គ្រូ ?

14. តើលោកគ្រូ/អ្នកគ្រូគិតថាការបញ្ចូលICTធ្វើឱ្យបង្កើនប្រសិទ្ធភាពការងាររបស់លោកគ្រូអ្នកគ្រូដែរឬទេ? ហេតុអ្វី?
15. តើលោកគ្រូ/អ្នកគ្រូគិតថាការបញ្ចូលICTមានឥទ្ធិពលដល់ប្រសិទ្ធភាពនៃរៀនរបស់សិស្សដែរឬទេ?
16. តើលោកគ្រូ/អ្នកគ្រូគិតថាកម្មវិធី និងឧបករណ៍ផ្សេងៗរបស់ICTបានជួយលោកគ្រូ/អ្នកគ្រូក្នុងការបង្ហាញអំពីភាពអរូបីទៅកាន់សិស្សដែរឬទេ? ហេតុអ្វី?
17. ជារួមមក តើកម្មវិធី និងឧបករណ៍ផ្សេងៗរបស់ICTជួយលោកគ្រូ/អ្នកគ្រូ និងសិស្សក្នុងសកម្មភាពបង្រៀន និងរៀនដោយរបៀបណា?

សូមអរគុណលោកគ្រូ/អ្នកគ្រូសម្រាប់ការចូលរួមបទសំភាសន៍!

APPENDIX D: APPROVAL LETTER



ព្រះរាជាណាចក្រកម្ពុជា
ជាតិ សាសនា ព្រះមហាក្សត្រ

មជ្ឈមណ្ឌលស្រាវជ្រាវគម្រោងស្រាវជ្រាវជំនាន់ថ្មី

NEW GENERATION PEDAGOGICAL RESEARCH CENTER

ថ្ងៃចន្ទ ០៦កើត ខែអាសាឍ ឆ្នាំខាល ចតុស័ក ព.ស. ២៥៦៦
រាជធានីភ្នំពេញ ថ្ងៃទី០៤ ខែកក្កដា ឆ្នាំ២០២២

សូមគោរពជូន

លោក ឪ សុភត្តិ នាយកសាលារៀនជំនាន់ថ្មី វិទ្យាល័យព្រែកលៀម

កម្មវត្ថុ: សំណើសុំការអនុញ្ញាតឱ្យគ្រូនិស្សិតឈ្មោះ យុន ស៊ីណុត បានចុះប្រមូលទិន្នន័យស្រាវជ្រាវលើ
ប្រធានបទ ការយល់ឃើញរបស់គ្រូទៅលើការបញ្ចូលICTក្នុងការបង្រៀនមុខវិជ្ជា
រូបវិទ្យា នៅសាលារៀនជំនាន់ថ្មី វិទ្យាល័យព្រែកលៀម។

សេចក្តីដូចបានជម្រាបក្នុងកម្មវត្ថុខាងលើនេះ ខ្ញុំសូមជម្រាបជូនលោកនាយកថា គ្រូនិស្សិតឈ្មោះ
យុន ស៊ីណុត កំពុងសិក្សាស្រាវជ្រាវសរសេរសារណាបទបញ្ចប់ថ្នាក់បរិញ្ញាបត្រជាន់ខ្ពស់អប់រំ ឯកទេស
ប្រឹក្សាគម្រោងស្រាវជ្រាវ ជំនាន់ទី៣ នៅមជ្ឈមណ្ឌលស្រាវជ្រាវគម្រោងស្រាវជ្រាវជំនាន់ថ្មី នៃវិទ្យាស្ថានជាតិអប់រំ។
ការចុះប្រមូលទិន្នន័យរបស់គ្រូនិស្សិតនឹងប្រព្រឹត្តទៅចន្លោះពីថ្ងៃទី០៤ ខែកក្កដា ដល់ថ្ងៃទី ៣១ ខែកក្កដា
ឆ្នាំ២០២២។

អាស្រ័យហេតុនេះ សូមលោកនាយក មេត្តាជ្រាប និងអនុញ្ញាតឱ្យគ្រូនិស្សិតរូបនេះ ជួបលោកគ្រូ-
អ្នកគ្រូដែលជាគ្រូបង្រៀនមុខវិជ្ជារូបវិទ្យាបានផ្តល់ព័ត៌មានទាក់ទងនឹងប្រធានបទស្រាវជ្រាវខាងលើដោយក្តីអនុ-
គ្រោះ។

សូមលោកនាយកទទួលនូវការគោរពរាប់អានដ៏ស្មោះអំពីខ្ញុំ។

ឯកសារ មសគថ.

បានយល់ (មេត្តាឱ្យគ្រូនិស្សិត
យុន ស៊ីណុត ចុះប្រមូលទិន្នន័យ
នៅថ្ងៃទី ០៤ ខែកក្កដា ឆ្នាំ ២០២២
សាលារៀន
ថ្ងៃទី ០៤ ខែកក្កដា ឆ្នាំ ២០២២
លោក ឪ សុភត្តិ

ប្រធានមជ្ឈមណ្ឌល

បណ្ឌិតសភាចារ្យ ច័ន្ទ រៀន

APPENDIX E: CONSENT FORM (KHMER VERSION)

សំណើសុំធ្វើការសម្ភាសន៍(សម្រាប់គ្រូ)

នាងខ្ញុំឈ្មោះ **យុន ស៊ីណុត** គឺជាគុសិស្សកំពុងសិក្សាថ្នាក់បរិញ្ញាបត្រជាន់ខ្ពស់ ឯកទេសប្រឹក្សាគរុកោសល្យ នៅមជ្ឈមណ្ឌលស្រាវជ្រាវគរុកោសល្យជំនាន់ថ្មីនៃវិទ្យាស្ថានជាតិអប់រំ ។ នាងខ្ញុំបាននឹងកំពុងធ្វើការស្រាវជ្រាវលើប្រធានបទ **“ទស្សនៈរបស់គ្រូទៅលើការប្រើប្រាស់កម្មវិធីICTក្នុងការបង្រៀនមុខវិជ្ជារូបវិទ្យា”** ដែលនេះគឺជាការសរសេរសារណាខ្លីមួយ សម្រាប់បញ្ចប់ការសិក្សាថ្នាក់អនុបណ្ឌិតផងដែររបស់នាងខ្ញុំ។

១- គោលបំណងនៃការស្រាវជ្រាវ

ការសិក្សានេះមានគោលបំណងស្វែងយល់អំពីការយល់ឃើញរបស់គ្រូ ចំពោះការប្រើប្រាស់ICT ទៅលើការបង្រៀន ក្នុងមុខវិជ្ជារូបវិទ្យា ដើម្បីជាជំនួយក្នុងការបង្រៀន និងស្វែងយល់ពីកត្តាប្រឈមក្នុងការប្រើប្រាស់ICT ក្នុងការបង្រៀន និងរៀន។ ទន្ទឹមនឹងនេះ ដើម្បីស្វែងរកពីកត្តាមួយចំនួនដែលកម្មវិធីICTជាជំនួយក្នុងដល់បង្រៀនរបស់គ្រូ និងការសិក្សា របស់សិស្សកាន់តែមានប្រសិទ្ធភាព។

២- ដំណើរការនៃការសម្ភាសន៍

ប្រសិនបើលោកគ្រូ-អ្នកគ្រូ ចូលរួមក្នុងការសម្ភាសន៍ នោះលោកគ្រូ-អ្នកគ្រូនឹងត្រូវសួរនូវសំណួរមួយចំនួនដែលទាក់ទងទៅនឹងប្រធានបទស្រាវជ្រាវ។ ក្នុងសំណួរនីមួយៗអាចចំណាយពេលចន្លោះពី ២ ទៅ ៣នាទី ដូចនេះការសម្ភាសន៍អាចចំណាយពេលសរុបប្រមាណ ៤០ទៅ៥០នាទី។ អំឡុងពេលសម្ភាសន៍ នាងខ្ញុំសុំអនុញ្ញាតថិតជាសម្លេងដើម្បីងាយស្រួលក្នុងការប្រមូលព័ត៌មាន។ ចំពោះអត្តសញ្ញាណរបស់លោកគ្រូ-អ្នកគ្រូ ដូចជាឈ្មោះនឹងមិនត្រូវបង្ហាញក្នុងការស្រាវជ្រាវនោះទេ បើគ្មានការអនុញ្ញាតពីលោកគ្រូ-អ្នកគ្រូ ហើយការថិតសម្លេងនេះគ្រាន់ជាជំនួយសម្រាប់នាងខ្ញុំក្នុងការបកស្រាយទិន្នន័យប៉ុណ្ណោះ។

៣- គោលការណ៍រក្សាការសម្ងាត់

រាល់ព័ត៌មានទាំងអស់នឹងរក្សាការសម្ងាត់ ដោយមានតែអ្នកស្រាវជ្រាវតែម្នាក់ប៉ុណ្ណោះដែលអាចយកមកប្រើប្រាស់បាន។ ការឆ្លើយតបរបស់លោកគ្រូ-អ្នកគ្រូមិនមែនជាតេស្ត ហើយក៏គ្មានចម្លើយខុសឬត្រូវដែរ។ ព័ត៌មានរបស់លោកគ្រូ/អ្នកគ្រូ ពិតជាមានសារៈសំខាន់ណាស់ សម្រាប់ការសិក្សារបស់នាងខ្ញុំ ហើយនាងខ្ញុំសង្ឃឹមថាលោកគ្រូ-អ្នកគ្រូ អាចផ្តល់កិត្តិយសចូលរួមជាមួយការស្រាវជ្រាវនេះ។ ទន្ទឹមនឹងនេះ លោកគ្រូ/អ្នកគ្រូមានជម្រើសក្នុងការចង់ចូលរួម ឬមិនចង់ចូលរួមក៏បាន។ ប្រសិនបើលោកគ្រូ-អ្នកគ្រូ ជ្រើសរើសចូលរួមជាមួយការសិក្សានេះ លោកគ្រូ-អ្នកគ្រូ មានសិទ្ធិមិនឆ្លើយសំណួរណាមួយ ឬបញ្ឈប់ការឆ្លើយសំណួរនូវត្រង់ចំណុចណាមួយក៏បាន។

៤- ការទំនាក់ទំនងមកកាន់អ្នកស្រាវជ្រាវ

ប្រសិនបើលោកគ្រូ-អ្នកគ្រូមានសំណួរឬបញ្ហាណាមួយពាក់ព័ន្ធនឹងការស្រាវជ្រាវនេះ លោកគ្រូ-អ្នកគ្រូអាចទំនាក់ទំនងមកកាន់ខ្ញុំដែលជាអ្នកស្រាវជ្រាវតាមរយៈលេខទូរស័ព្ទនិងតេឡេក្រាម 016 573 733 ឬតាមរយៈ Email: sinot.yun@gmail.com ។

៥- កិច្ចព្រមព្រៀងក្នុងការចូលរួម

គោលបំណងរបស់ការស្រាវជ្រាវបានពន្យល់យ៉ាងច្បាស់ដោយអ្នកស្រាវជ្រាវ ហើយខ្ញុំនឹងចូលរួមក្នុងការសិក្សាស្រាវជ្រាវមួយនេះ។ ខ្ញុំដឹងថា ខ្ញុំអាចឆ្លើយឬមិនអាចឆ្លើយនូវសំណួរណាមួយ ដោយគ្មានការពិន័យអ្វីទាំងអស់។

<p>អ្នកចូលរួម</p> <p>កាលបរិច្ឆេទ៖.....</p> <p>ហត្ថលេខា៖.....</p> <p>ឈ្មោះ៖.....</p>
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<p>អ្នកស្រាវជ្រាវ</p> <p>កាលបរិច្ឆេទ៖.....</p> <p>ហត្ថលេខា៖.....</p> <p>ឈ្មោះ៖.....</p>
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