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An Investigation of Factors Influencing Physics Teachers' Intention to Use Virtual Laboratory at the International Schools in Amman

دراسة العوامل المؤثرة في مقاصد معلمي الفيزياء لاستخدام المختبر الافتراضي في المدارس الدولية في عمان

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Authorization

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This Thesis entitled **"An Investigation of Factors Influencing Physics Teachers' Intention to Use Virtual Laboratory at the International Schools in Amman"** have been discussed and certified on 27/6/2020

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Dedication

I want to dedicate this humble work to

My late Father

Who taught me to be honest, achieve my dreams, and always strive for the best.

My wonderful Mom

Whose affection, love, encouragement, and faith made me able to get such success.

My lovely sisters

For their unconditional love, guidance, and support

My dearest husband

For constantly being by my side and his endless support

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List of Abbreviations

Abbreviation	**Meaning**
TPACK	technological pedagogical and content knowledge
VL	Virtual Laboratory
PEOU	Perceived Ease of Use
PU	Perceived Usefulness
BI	Behavioral Intention

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An Investigation of Factors Influencing Physics Teachers' Intention to Use Virtual Laboratory at the International Schools in Amman

By: Afaf Abu-Kishk

Supervisor: Sani Al-Khasawneh, PhD

Abstract

The study investigates the factors that affect the intention of using the virtual labs in teaching physics, including the TPACK and teacher self-efficacy, for physics teachers who need to be able to teach physics using the virtual labs in the Jordanian context. To achieve the objective of the study a descriptive-survey research methodology was conducted to 101 physics teachers who teach physics in the international schools for the second semester of the academic year 2019/2020. One instrument was prepared which was the electronic survey and after checking the validity and reliability of the instrument, the survey was distributed.

The findings of the study analysis demonstrated in four main results. (1) Physics teachers' TPACK positively affected teacher self-efficacy, (2) Physics teachers' TPACK positively influenced perceived ease of using virtual labs,(3) Physics Teachers' TPACK and perceived ease of use (PEOU) had a positive effect on the perceived usefulness of using the virtual labs (PU) and (4) The researcher found that Physics teachers' TPACK, teacher self-efficacy, perceived ease of use, and perceived usefulness of technology had a positive effect on their intention to use virtual labs.

In light of the findings of the study, the researcher presented several recommendations that she reached through her study:

Workshops and training programs about the virtual labs should be done to improve the level of TPACK, virtual labs training should be provided to physics teachers to learn more about using the virtual labs to overcome the unwillingness to learn virtual labs and decision-makers should use this survey to find out how well the teachers accept the use of virtual laboratories before building virtual laboratories.

Keywords: TAM, Virtual labs, TPACK, Teacher Self-Efficacy, Perceived Ease of Use, and Perceived Usefulness.

دراسة العوامل المؤثرة في نوايا معلمي الفيزياء لاستخدام المختبر الافتراضي في المدارس الدولية في عمان

اعداد: عفاف عبد الحكيم عوني أبوكشك

اشراف: الدكتورة ساني الخصاونة

الملخص

تبحث الدراسة في العوامل التي تؤثر على نية استخدام المختبرات الافتراضية في تدريس الفيزياء، بما في ذلك معرفة المحتوى التربوي التكنولوجي والكفاءة الذاتية للمعلمين، لمعلمي الفيزياء الذين يقومون بتدريس الفيزياء باستخدام المختبرات الافتراضية في السياق الأردني، ولتحقيق أهداف الدراسة تم اعتماد المنهج الوصفي لـ 101 معلم ومعلمة فيزياء الذين يقومون بتدريس الفيزياء في المدارس الدولية للفصل الدراسي الثاني 2020/2019 ، وتم اعداد أداة الدراسة وهي استبانة الكترونية وبعد التأكد من صدق وثبات الأداة تم توزيع الاستبانة .

وتوصلت الدراسة الى عدد من النتائج أبرزها (1) معرفة معلمي الفيزياء للمحتوى التربوي التكنولوجي للمختبرات الافتراضية سيؤثر بشكل إيجابي على الكفاءة الذاتية للمعلم (2) معرفة معلمي الفيزياء للمحتوى التربوي التكنولوجي للمختبرات الافتراضية سيؤثر بشكل إيجابي على سهولة استخدام المختبرات الافتراضية من قبل معلمي الفيزياء (3) معرفة معلمي الفيزياء للمحتوى التربوي التكنولوجي للمختبرات الافتراضية وسهولة استخدام المختبرات الافتراضية سيؤثر بشكل ايجابي على الفائدة المتوقع حدوثها عند استخدام معلمي الفيزياء للمختبرات الافتراضية (4) وفي النهاية وجدت الباحثة أن معرفة معلمي الفيزياء للمحتوى التربوي التكنولوجي للمختبرات الافتراضية والكفاءة الذاتية للمعلمين وسهولة استخدام المختبرات الافتراضية والفائدة المدركة لاستخدام المختبرات الافتراضية ستؤثر بشكل ايجابي على نية استخدام المختبرات الافتراضية.

وفي ضوء النتائج التي توصلت اليها الدراسة، قدمت الباحثة مجموعة من التوصيات منها: يجب إجراء ورش العمل والبرامج التدريبية حول المختبرات الافتراضية لتحسين مستوى معرفة معلمي الفيزياء للمحتوى التربوي التكنولوجي للمختبرات الافتراضية، ويجب توفير تدريب على كيفية استخدام المختبرات الافتراضية لمعلمي الفيزياء لمعرفة المزيد حول استخدام المختبرات الافتراضية للتغلب على

عدم الرغبة في تعلم المختبرات الافتراضية وفي النهاية يجب على صناع القرار استخدام هذه الاستبانة لمعرفة مدى قبول المعلمين لاستخدام المختبرات الافتراضية قبل بناء المختبرات الافتراضية.

الكلمات المفتاحية: نموذج قبول التكنولوجيا، المختبرات الافتراضية، المحتوى التربوي التكنولوجي، الكفاءة الذاتية للمعلم، سهولة الاستخدام، الافادة مدركة

CHAPTER ONE

Background and Significance of the Study

1.1 Introduction

In today's world, education and technology cannot be considered independent of each other and the integration of technology into education has become highly vital and effective in the process of learning.

The integration of technology as a tool is used for improving students' learning, a better understanding of the lesson content, and developing a higher thinking skill for students. The integration of technology into education can be defined as the appropriate integration of the procedures of learning and teaching, including the evaluation of lessons and learning outcomes, with the suitable for the goals (Gilakjani, 2017).

During the last decades, information, and communication technology (ICT) has witnessed rapid development in all educational fields (Pelgrum, 2001). The course of science is being noticed and it relates to technology, many educational experts are taking into consideration the importance of integrating information and communication technology with science (Babateen, 2011).

Physics is one of the subjects in science that consist of many concepts, and mastering the basic concepts are very essential in Learning physics (Gunawan, Nisrina, Suranti, Ekasari & Herayanti, 2018), especially when it comes to knowing when, how and why physics is applied (Lindstorm & Sharma, 2009).

Physics can be considered as one of the subjects in science that is less preferred by students, they tend to consider physics as a difficult subject since it deals with problems and calculations and it is considered as experimental evidence, criticism, and rational discussion (Kustusch, 2016). Many researchers in Physics educations have shown the ineffectiveness of traditional instructional methods and shed light on the lack of understanding science and content when students were subjected to conventional teaching (McDermotti, 2001; Onyesolu, 2009). The laboratory experiments are one of the main efficient means to make difficult theories simpler and clearer. Learning science has been restrained by the deficiency of laboratory equipment in schools (McDermott, 2001). Some experiments conducted in a real laboratory can consider an obstacle for its less effective in cost and equipment preparations by lab staff. Therefore, we need alternative laboratory equipment where teachers and students can conduct different experiments at any time in safe conditions. One of the solutions that may help to fix the problem is to use a virtual laboratory which is considered one of the power-efficient tools that offer alternative learning environments that attract students' attention and interests (Onyesolu, 2009).

The technique of using virtual labs has been applied in various international schools that teach physics in Jordan, and many studies have investigated the effect of using virtual labs in teaching physics on students' achievements (Naser, 2018; Mahmoud, 2017). However, there is a paucity of research, which studied teachers' behavior toward using virtual labs.

Therefore, it is important that before the international schools build these virtual labs, they need to understand how well teachers accept the use of virtual laboratory in teaching physics since teachers can be considered as one of the most important components of classroom managements and important responsibilities in this process, one of these responsibilities is having a positive attitude towards technology which enables them to use technology in learning environments (Young JuJoo, Sunyoung Park & Euge, 2017).

For these reasons, the researcher investigated the factors influencing physics teachers’ intention to use a virtual laboratory at the international schools in Amman.

1.2 Problem Statement

The technique of using virtual labs has been applied in various schools that teach physics in Jordan, and many studies have investigated the effect of using virtual labs in teaching physics on students' achievements (Naser, 2018; Mahmoud, 2017). However, there is a lack of studies that investigate teachers’ behaviors and attitudes toward using virtual labs in teaching physics. Understanding users’ behaviors are a very important issue and must be investigated when applying new technology (Venkatesh & Davis, 2003; Huang & Liaw, 2005). Achieving the objectives of the actual application of any technology is influenced by the user's acceptance and desire to use it (Archambault & Crippen 2009).

At the same time, there are many researchers investigated the effect of using the virtual laboratory in Jordan and they have claimed that using a virtual laboratory in teaching physics has a positive effect on students' achievements (Mahmoud, 2017; Mahmoud & Ateyeh, 2019). Recently, Jordanian international schools start building virtual labs to teach physics. However, there is a paucity of research that studied teachers' behavior toward using virtual labs. For this reason, the researcher observes that there is a gap in previous studies which concerned about investigating the effect of using virtual labs in Jordan while ignoring teachers' behavior. It is imperative to expose teachers' behavior and attitudes due to their effective impact in achieving the desired benefit of that technique (Clark, 2000).

In this study, the researcher focused on investigating the factors that affect the intention of using the virtual labs in teaching physics, including the technological pedagogical content knowledge **(**TPACK) and teacher self-efficacy, for physics teachers who need to be able to teach physics using the virtual labs in the International schools in the Jordanian context.

1.3 Objective of the Study

The main objective of this study is to investigate the factors that affect the intention of using the virtual labs in teaching physics, including the TPACK and teacher self-efficacy, for physics teachers who need to be able to teach physics using the virtual labs in the Jordanian context.

1.3.1 The Specific objectives of this study: -

- The effect of the physics teacher's TPACK on teacher self-efficacy.
- The effect of physics' teachers' TPACK on the perceived ease of using the virtual labs.
- The effect of physics teachers' TPACK and perceived ease of use on the perceived usefulness of using virtual labs.
- The effect of physics teachers' TPACK, teacher self-efficacy, perceived ease of use, and perceived usefulness of technology on the intention of using the virtual labs.

1.4 The hypothesis of the study

Hypothesis 1: Physics teachers’ TPACK will positively affect teacher self-efficacy.

Hypothesis 2: Physics teachers’ TPACK will positively affect the perceived ease of using virtual labs.

Hypothesis 3: Physics Teachers’ TPACK and perceived ease of use will positively affect the perceived usefulness of using the virtual labs

Hypothesis 4: Physics teachers' TPACK, teacher self-efficacy, perceived ease of use, and perceived usefulness of technology will affect intention to use virtual labs.

1.5 Significance of the Study

This study will be significant in two domains; theoretical importance and practical importance.

1.5.1 Theoretical Importance

- Integrating the technology acceptance model (TAM) with Technological Pedagogical Content Knowledge (TPACK)

- Knowing the factors influencing physics teachers' intention to use virtual labs: TPACK, self-efficacy based on the technology acceptance model among Jordanian schools.

- The theory lies in the usefulness of this study for researchers to conduct similar studies in other fields.

1.5.2 Practical Importance

- The study helps to identify the most important challenges that teachers may face while using virtual laboratories

- The study helps the school administrators to know what to consider before building the virtual labs.

- This study helps Decision-makers in making decisions regarding the provision of virtual laboratories in Jordanian schools to teach physics.

1.6 Limitations

This study was applied within the following limits: -

It is specified in private International schools such as Amman Academy School, Cambridge School, Mashrek School, Islamic Educational College, Sands School, ISO School, Oxford School, Al-Maharat School, and New English School and it is located in Amman, Jordan. It involves teachers who teach physics in Jordanian private international schools during the second semester of the academic year 2019-2020. It aims to influence physics teachers' intention to use virtual labs: TPACK, self-efficacy, and technology acceptance model.

1.7 Delimitations

This study was limited by the amount of time, the difficulty in generalizing the results of the study, and the adequacy and stability of the tool used.

1.8 Study definitions

The terminology is terminologically and procedurally defined as follows: -

Virtual Labs

According to (Galan, **Heradio, Torree, Dormido&Esquembre, 2016) Virtual labs are defined** as a computer-based simulation that provides simulations and ways of work similar to hands-on labs

The researcher defines it as: It is a computer-based activity where students interact with experimental apparatus or other physics experiments via a computer interface.

TPACK

According to (Schmidt, Baran, Thompson, Mishra, Koehler, &Shin, 2009) TPACK is defined as a theoretical framework to show the integration of technology, pedagogy, and content knowledge needed to integrate technology use into learning.

The researcher defines it as: It is a theory that was developed to explain the set of knowledge that teachers need to teach their students how to use the virtual labs.

Teacher Self-Efficacy

According to (Hoy, 2000) Teacher self-efficacy is defined as personal feelings and beliefs about their abilities as a teacher. It includes both their feelings about their ability to design an instruction to accomplish instructional objectives.

The researcher defines it as a set of beliefs about teachers' ability to teach students and to guide them to use the virtual labs effectively.

Perceived Ease of Use

According to (Davis, 1989) Perceived ease of use is defined as the degree to which the user believes they will use the technology without any effort.

The researcher defines it as one of the independent constructs in the Technology Acceptance Model (TAM) and it is a degree to which a person believes that using the virtual lab will be effortless.

Perceived Usefulness

According to (Davis, 1989) Perceived usefulness is defined as the degree to which a user knows that using a specific system would enhance the user performance.

The researcher defines it as one of the independent constructs in the Technology Acceptance Model (TAM) and it is a degree to which a person believes that using the virtual lab will improve their job performances.

TAM

According to (Davis, 1989) TAM is defined as the Technology Acceptance Model and one of the most significant models of technology acceptance, with two important factors influencing users' intention to use new technology: perceived ease of use and perceived usefulness

The researcher defines it as: It is an information system theory that models how teachers come to accept the use of virtual labs.

CHAPTER TWO

Literature Review and Previous Studies

This chapter encompasses previous studies, literature review, and theoretical framework about the factors influencing physics teachers' intention to use virtual laboratory.

2.1 Literature review

The literature Review tackles theoretically the virtual labs, TPACK, self-efficacy, TAM, Perceived Ease of Use and Perceived Usefulness

Virtual labs

Virtual lab concept

The researchers Chen, Song, and Zhang (2010) define the virtual laboratory as a software program for simulating and performing a laboratory environment and the researchers Galan**,** Heradio, Torree, Dormido, and Esquembre, (2016) referred it as a computer-based simulation that provides ways of work similar to hands-on labs.

The Component of virtual labs

There are many components of the virtual lab and according to Dillion (2007), the main components of the virtual labs are:

- Computer devices: it includes personals computers that are linked with a local or international network.
- Communication Network and Hardware: all the sets should be linked to the computer so that the students can do their experiments and stimulations through the computer.
- Programs: These programs are designed interestingly and interactively which helps to attract students' attention to do the experiments.

- Co-operation Programs &Management: These programs will register the students into the lab program and determine the kinds of access that should be provided to each user.
- Technical Staff: Repair any malfunction that may occur

The Characteristics of Education in Virtual Lab:

There are many characteristics of using virtual labs in education and according to many researchers such as (Harry & Edward, 2005) using virtual labs will encourage the students to do different kinds of experiments, performing different kinds of experiments that are difficult to be done in a traditional laboratory, producing new intellectual model in education better than the real, and minimizing the learning time spent in the traditional lab as well. Moreover, Tatlı and Ayas (2010) stated that using virtual labs will increase academic success for the students and could enhance and emphasize the use of educational strategies which are based on constructivist and collaborative teaching method. Also according to Ranjan (2017) using virtual laboratories will provide the students with significant virtual experiences to present the concepts, processes, and principles that they have learned, and that will help the students to understand any concepts readily.

The Usefulness of Virtual Laboratories in Teaching Physics:

Physics can be considered one of the subjects that are less preferred for students because it deals with calculations and problems. Many researchers in physics educations have shown the ineffectuality of traditional methods and shed the light on the misunderstanding of physics concepts and processes when students were subjected to conventional teaching and demonstrations (Kurniawati, Wartono & Diantoro, 2014; Kustusch, 2016).

The laboratory experiments are one of the most important means to make any theory simpler and clearer (Aqel, 2019). Learning physics has been restrained by the deficiency of laboratory equipment in schools. Some experiments that have been conducted in a real laboratory can consider an obstacle for its less effective in cost and equipment preparations by lab staff (Oidov, Tortogtokh & Purevdagva, 2012). From these points came the idea of using virtual laboratories.

Research studies have shown that visualization of any concept through computer programs can help the student to understand physics concepts by linking mental images to the concepts (Nayel, 2017). According to Mirçik and Saka (2018), using computer programs will provide different opportunities for students to develop their understanding of physics. Moreover, using computer programs and simulations will provide the opportunity for a student to choose any existing object in the program and transfer it into the experiment environment to make the required setting (rotating, changing the values, etc.) and this will help the students to develop their critical thinking.

Jimoyiannis and Komis (2001) argued that virtual labs that contain programs and simulations can be used as an alternative learning media because they can help students to construct a conceptual understanding, overcome weaknesses in theoretical physics and develop their problem-solving methods.

The technique of using a virtual laboratory has been applied in various schools that teach physics in Jordan (Naser, 2018; Mahmoud, 2017). Although, there was a lack of studies that indicate teachers accepting it.

Therefore, It is important that before schools start building these virtual labs, they need to understand how well teachers accept the use of virtual laboratory in teaching physics since teachers can be considered as one of the most important components of classroom managements and important responsibilities in this process, one of these responsibilities is having a positive attitude towards technology which enables them to use technology in learning environments (Adiguzel & Berk, 2009; Naser 2018).

Technological Pedagogical Content (TPACK)

TPACK Concept

There are various ways to define TPACK, one of these definitions is a theoretical framework for representing the interaction of technology, pedagogy, and content knowledge that is needed to integrate technology in the learning process (Schmidt, Baran, Thompson, Mishra, Koehler & Shin, 2009).

Component of TPACK

The Term of TPACK, although it can consider being a new term, the idea of TPACK has been around for a long time. It was first mentioned in Mishra (1998) through the context of educational Design. Pierson (1999), Keating, and Evans (2001) all of them describe the relationships between pedagogy, technology, and content. TPACK is a framework that introduces the relationships between all three strains of knowledge (pedagogy, technology, and content) (Mishra & Koehler, 2006). There are seven components included in the TPACK framework.

- Technology Knowledge (TK): Technology Knowledge indicates the knowledge of different techniques. Extended from low-technology, such as papers and pencils to digital technology such as software and the Internet.
- Content Knowledge (CK): Teachers should know the content that they are going to teach and how the quality of Knowledge is different for several contents (Mishra & Koehler, 2008).

- Pedagogical knowledge (PK): It indicates the procedures and the methods of learning and includes knowledge, lesson plans, and student planning.
- Pedagogical content knowledge (PCK): It includes the content knowledge that deals with the learning process (Shulman, 1986). PCK blends with both content and pedagogy to develop better learning in the content areas.
- Technological content knowledge (TCK): It includes knowledge on how technology can make new representations for specific content.
- Technological pedagogical knowledge (TPK): It includes the knowledge of how different technologies should be used in the learning process, and to know that using new technologies should change the path of how teachers are teaching.
- Technological pedagogical content knowledge (TPACK**):** It refers to the knowledge required by teachers for integrating technology into their teaching.

TPACK has been adopted by many researchers for describing the knowledge and skills that are needed to integrate technology into education (Graham, 2011; Koh, Chai, & Tsai, 2010). Moreover, TPACK considers being a useful frame for thinking about what kind of knowledge teachers should have to merge technology into learning and how they can develop their knowledge (Schmidit, Baran, Thompson, Mishra, Koehler & Shin, 2009).

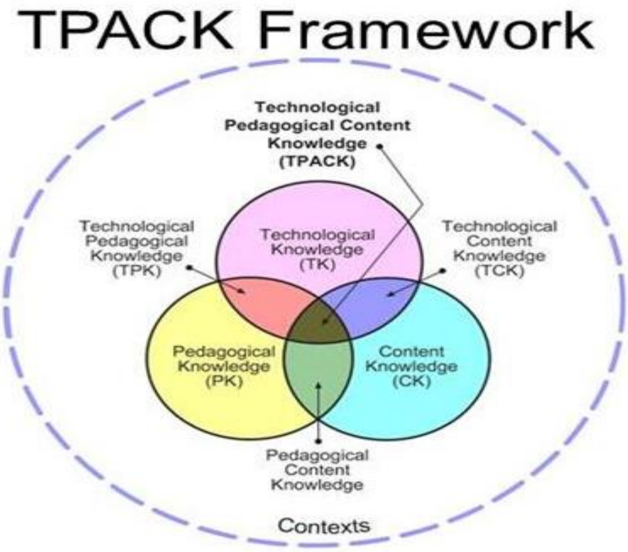

Fig. (1): TPACK Framework (Schmidit, Baran, Thompson, Mishra, Koehler & Shin, 2009, p.124)

Teacher Self-Efficacy: -

Teacher self-efficacy is defined as the teachers' beliefs about their skills and their ability as a teacher. It contains both their abilities and their beliefs to outline instructional objectives (Gavora, 2010) and their confidence in their ability to support student teaching (Hoy, 2000).

Many studies have investigated and concluded that teacher self-efficacy has a good influence on the students' achievement (Cox, 2010; Young JuJoo, Sunyoung Park, & Eugene, 2017). These studies have concluded that teachers with high self- efficacy will ask their students open-ended questions, do inquiry methods, and prefer small-group teaching activities more than the teachers with low self-efficacy. Moreover, teachers with high self-efficacy are more willing to do creative learning methods, more open to new ideas, and more willing to adopt better teaching methods do (Brouwers&Tomic, 2003; Isaac, Abdullah, Ramayah & Mutahar,2017) teacher can importantly motivate to integrate technology in the classroom.

Many researchers have proved the relationship between the intention to use technology and self-efficacy (Baker-Eveleth & Stone, 2008; Anderson, Groulx, & Maninger, 2011; Valtonen, Kukkonen, Sormunen, Dillon, & Sointu, 2015; Isaac, Abdullah, Ramayah & Mutahar, 2017). Teachers believe that the integration of technology in the classroom is a very important predictor of their intention to use technology in the classroom (Anderson, 2011).

Technology Acceptance Model

The TAM is one of the most important theories for predicting technology acceptance, and it has been adopted by many theoretical studies (Bazelais, Doleck&Lemay, 2018) and it has been appeared in 1998 (Davis, 1988). Moreover, it considers being one of the most popular research models that predict the acceptance of technology by individuals' users. TAM has been verified by various studies that studied the technology acceptance behavior in various information system constructs (Joo, Park, & Lim 2018).

Two parts affect the TAM model: the perceived usefulness (PU) and the perceived ease of use (PEOU), Davis defines the perceived ease of use as the degree to which users believe that they will use new technology without difficulty and perceived usefulness defines it as how much individual users recognize that new technology will help improve performance.

According to TAM, the two parts are the most important determinants to the actual use; the two parts are affected by external variables. The main external factors are usually considered Cultural factors, Social factors, and Political factors. Social factors include skills and languages whereas political factors are mainly the effect of using technology in politics (Mai and Liu, 2007).

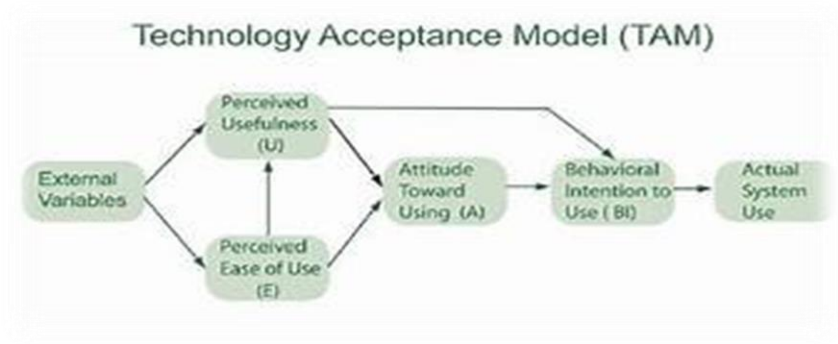

Fig (2): Technology Acceptance Model (TAM) (Davis, 1989).

TAM has been widely used in the model to understand and explain user's behavior toward the information technology system, there have been several studies conducted by researchers to modify the TAM by adding new variables to it (Joo, Park, & Lim, 2018).

In this study, the researcher added new variables to the TAM model which are the TPACK and self-efficacy and although these variable are important, there are not many studies that pay attention to the significant influence of TPACK and self- efficacy on physics teachers' intention to use technology (Joo, Park& Lim, 2018).

Perceived Ease of Use and Perceived Usefulness:

There are various ways of defining Perceived ease of use; one of these definitions is the degree to which users believe they will use new technology without difficulty (Davis, 1989). While Perceived usefulness is defined as how much the individual users can know that the new technology will improve their performance (Davis, 1989).

According to TAM, researchers have discovered the effect of perceived ease of use on perceived usefulness (Chow, Herold, Choo, & Chan, 2012; Joo, Lee, &Ham, 2014; Lee & Lehto, 2013). Moreover, they have confirmed that the perceived ease of use and perceived usefulness importantly affect teachers' intention to use technology (Jeung, 2014; Davis, Bagozzi & Warshaw, 1989; Teo, 2011; Wangpipatwong, Chutimaskul, & Papasratorn, 2008).

2.2 Previous studies

This part deals with a review of previous studies conducted in the field of Virtual labs, TPACK, self-efficacy, perceived ease of use, perceived usefulness and Tam model, the researcher benefited from it in conducting the study, as the researcher reviewed a set of Arabic and English studies related to the subject of the study and then presented it from the oldest to the newest.

Virtual labs

Al-masaeed (2013), identified the effect of using physical virtual laboratories on the achievement of Jordanian university students by distributing a survey. The study sample consisted of 29 public and private universities. The result was that using the virtual laboratory method is more effective than the usual method.

Nayel (2017) investigated the effectiveness of using virtual physics laboratories in raising the level of academic achievement for first-year secondary school students in geographical schools in Khartoum locality and to know the point of view for the secondary school teachers in Sudan towards the use of this technology in teaching physics. The results were as followed 1-The use of virtual physics laboratories in teaching physics raises the level of academic achievement for first-year secondary students in geographical schools. 2- There are individual differences in academic achievement at the gender level for girls when using virtual laboratories in teaching 3- the secondary schools' teachers have a positive attitude towards using virtual physics laboratories in teaching.

Mahmoud (2017), concluded a study to investigate the effect of using the virtual lab on the achievement and motivation of the ninth-grade students towards science. This study was conducted during the first semester of the academic year 2016/2017 on the ninth-grade students in Jordan. The study followed the semi-experimental approach on the study members who were chosen intentionally. The result was that the effectiveness of the virtual laboratory is just as effective as the usual method in its effect on achievement and motivation.

Mohammad and Atyeh (2019), investigated the effect of using the virtual laboratory on the achievement of upper preparatory students in physics in Jordan. The study took place during the first semester of the academic year 2016/2017 on ninth-grade students at Abdullah Bin Massoud Secondary School for Boys. The study adopted the semi-experimental method by implementing the purposive sampling. The study concludes with recommending conducting further studies on the impact of the virtual laboratory on students, optimal use of virtual laboratory in teaching physics, to increase the motivation and achievement among students.

Studies Related to TPACK

Mishra and Koehler (2008) improved a survey to measure TPACK, consisting of 33 items. This survey aimed to know and determine the level of TPACK knowledge in both group and individual levels. This survey has been completed twice (at the beginning and the end of the semester) by four faculty members and thirteen students. Mishra and Koehler found that the participants moved from examining pedagogy, content, and technology as for independent structures towards a more understanding of the development of TPACK.

Schmidt (2009) has developed a survey consisting of 50 items, a sample of (124) teachers showed huge growth in all seven components of the TPACK framework (TK, TP, CK, PK, TPK, TCK, and TPACK). Although the largest growth is in the TK, TCK, and TPACK. They also have shown that the survey has consistency (by using Cronbach's alpha) between 0.75 and 0.92) for each of the seven components.

Archambault and Crippen (2009) developed a survey including 24 statements to examine teachers' knowledge. A sample of 596 online teachers were asked to test their knowledge using a 5 point Likert scale in terms of pedagogy, content, and technology also the overlapping areas developed by united CK, TK, and PK, in this study, they founded the reliability and the internal consistency using the Cronbach's alpha of the survey which were in the range of 0.699 to0.911.

Studies Related to self-efficacy and TPACK

Lee and Tsai (2010) made a study to investigate the self-efficacy of teachers for a construct they called technological pedagogical content knowledge-web (TPACK-W), which investigates the integrating web technology in the classroom. They developed a TPACK-W Survey to show teachers' attitudes and self-efficacy for TPAK-W. The sample consisted of 558 high and elementary school teachers in Taiwan. They explored the validity and reliability by using exploratory and confirmatory factor analysis. The reliability of each construct was high. The (EFA) exploratory factor analysis discussed that the WPK and WPCK items are loaded on the same factor. The confirmatory factor analysis showed an important fit of the data to the model provided by the EFA.

Akturk and Ozturk, (2019) investigated a study to determine the relation between Technological Pedagogical Content Knowledge (TPACK) levels of teachers and their self-efficacy in integrating technology, the study group consisted of 401 teachers. The study detected that the most significant variable in the prediction of TPACK levels of teachers was teachers' self-efficacy. From this, it can be argued that in teacher education for achieving effective technology integration.

Studies Related to TPACK, Perceived Ease of Use, and Perceived Usefulness:

Horzum and Gungoren (2012) conducted a study to find out the relations between beliefs for WBI, WBI tools acceptance levels and web pedagogical content knowledge (WPCK) of science and technology, the study took a place in Turkey, the study group of the study consisted of 363 pre-service teachers. The findings of the study analysis demonstrated in three main results. (1) In beliefs of science and technology preservice teachers towards WBI.Their perceived difficulty will have a positive effect on their behavioral beliefs, their perceived difficulty and behavioral beliefs will have a positive effect on contextual beliefs. (2) In acceptance levels of science and technology preservice teachers towards WBI tools, Perceived ease of use and perceived usefulness towards WBI will have a positive attitude towards using these tools(3) Science and technology preservice teachers, Beliefs of science and technology preservice teachers towards WBI will have a positive attitude toward their WBI tools acceptance levels, Their WBI tools acceptance levels will have a positive attitude toward their WPCK.

Alsofyani (2012) conducted a study to investigate the use of Short Blended Online Training (SBOT) for the development of Technological Pedagogical and Content Knowledge (TPACK) using the technology acceptance model (TAM), a training workshop has been done on the NCEL website in Turkey for 100 participants. The results show a huge acceptance of this kind of training.

Measuring Self-Efficacy and Technology Acceptance Model (TAM)

Clark (2000) examined 28 teachers in middle school on their technology usage. The results have shown that teachers' belief in technology is considered a very important component in their classrooms and the teacher has a positive attitude to their need for more training in how to use technology.

Fordham and Vannatta (2005) examined 177 teachers' characteristics to know the specific indicators that predict the usage of technology in the classroom. Fordham and Vannatta concluded that the openness to change and enough training are the best predictors of usage. Moreover, teachers having higher Self-Efficacy are more likely to use technology in teaching.

Mai and Liu (2007) argued that the Internet Self-efficacy is more than just a judgmental of the ability internet skills; it examines the specific skills in how to use the internet browser. Mai and Liu found that the internet Self-Efficacy showed 48% of the diversity in perceived ease of use and the whole model showed an 80% difference in healthcare professionals' behavior intention on how to use web-based medical records.

Young JuJoo, Sunyoung Park, and Eugene (2017) explained the factors that will affect the intention of using technology which is the TPACK and teacher self-efficacy, for teachers who need to be able to integrate technology into teaching, this study is done in the Korean region, they have surveyed 300 students and the result is that TPACK affected teachers' intention to use technology through teacher self-efficacy, perceived ease of use, and perceived usefulness of the technology.

Isaac, Abdullah, Ramayah, and Mutahar (2017) used the technology acceptance model (TAM) with one previous variable to internet usage (internet self-efficacy) and one output variable (performance impact). A survey was built to collect data from 530 internet users among employees within government ministries-institutions in Yemen. The results showed that the data fit the extended TAM model well, and the findings of the multivariate analysis demonstrated four main results. (1) Internet self-efficacy has a high positive impact on perceived ease of use and perceived usefulness; (2) Perceived ease of use has a high impact on perceived usefulness and the actual use ; (3) Perceived usefulness has a strong positive impact on actual usage of the internet; and (4) The actual use has a positive influence impact.

2.3 Comment on Previous Studies

Some previous studies agreed with the researcher on the importance of studying teachers' behavior towards technology (Mai&Liu, 2007; Isaac, Abdullah, Ramayah& Mutahar, 2017). Many researchers agreed that the TAM model is one of the best models that is used to study the users' behavior toward technology (Fordham &Vannatta, 2005; Young JuJoo, Sunyoung Park& Eugene, 2017).

There are many researchers investigated the effect of using the virtual laboratory in Jordan and they have noted that using a virtual laboratory in teaching physics has a positive effect on students' achievements (Almasaeed, 2013; Mahmoud, 2017; Mahmoud&Ateyeh, 2019). Recently, Jordanian internationals schools start building virtual labs to teach physics. However, there is a paucity of research, which studied teachers' behavior toward using virtual labs.

The researcher founds that there is a gap in previous studies, which concerned about investigating the effect of using virtual labs in Jordan while ignoring teachers' behavior (Al-Masaeed, 2013; Mahmoud, 2017; Mahmoud&Ateyeh, 2019). Although many studies emphasized the importance of investigating the teachers' behavior towards technology (Mai & Liu, 2007; Young JuJoo, Sunyoung Park& Eugene, 2017).

For these reasons, the researcher suggested investigating the factors that affect the intention of using the virtual labs in teaching physics, including the TPACK and teacher self-efficacy, for physics teachers who need to be able to teach physics using this technique in the Jordanian context. Moreover, by investigating the relationships between these factors, the study will emphasize that TPACK and teacher self-efficacy are the most important factors to increase the intention of using any new technology (JuJoo, Sunyoung Park& Eugene, 2017). Moreover, this study will imply that improving TPACK will play a critical role in helping physics teachers to use virtual labs into their educational context and to have an effective learning environment.

2.4 Theoretical framework: Technology Acceptance Model

Based on the literature review and the theoretical framework, this study examined the structural relationships between the factors that affect the intention of using the virtual labs in teaching physics, including the TPACK and teacher self-efficacy, for physics teachers who need to be able to teach physics using the virtual labs in the Jordanian context.TPACK was considered a critical factor that influences other variables in this study. Figure 3 displays the research hypotheses for this study.

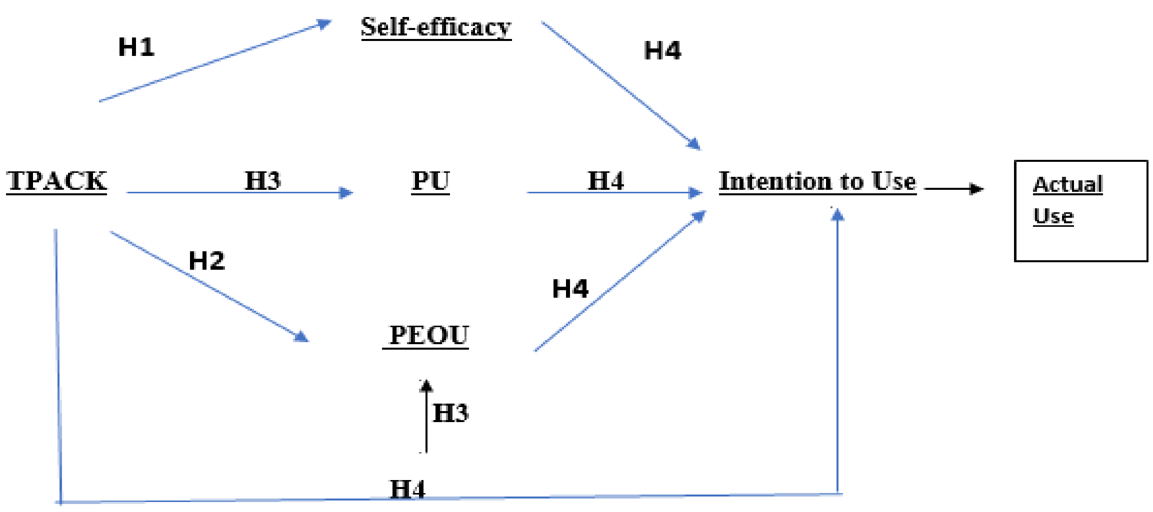

Fig (3): Hypothesized research model

CHAPTER THREE
Research Methodology

3.1 Introduction

This chapter discusses the methodology that was designed in carrying out the study. In this chapter, the researcher identified the procedures and techniques that were used to collect, process, and analysis of the data. The following subtitles are included: research design, target population, data collection instruments, data collection procedures, and finally data analysis.

3.2 Research Design

The researcher has used the descriptive-survey research methodology to investigate peoples' perceptions and beliefs of their thoughts, feelings, and actions (Lodico, Spaulding,& Voegtle, 2006). By distributing an electronic survey throughout various international schools in Amman to investigate the factors, influencing physics teachers' intention to use virtual labs: TPACK, self-efficacy, and technology acceptance model.

3.3 Population and the study sample

Population

The study population consists of physics teachers who teach physics in various international schools in Amman, Jordan. Which include (200) physics teachers according to the statistics of the Ministry of Education for the year 2019/2020.

The study sample

The researcher has distributed the questionnaire electronically to (101) physics teachers who teach physics in various international schools in Amman, Jordan.

3.4 Instrument

The Instrument is divided into two main parts which are: Demographic Information and Attitude Questionnaire.

Demographic Information

Demographic information includes age, year of experts, gender, and degree level. The researcher can easily and effectively collect these kinds of information with an electronic survey.

Attitude Questionnaire

To test the structural relationships between the various variables. The content was done for the use of Jordanian physics teachers, by doing the appropriate methods. The Survey used the 5-point Likert Scale ranging from 1 to 5 to have a fixed scale. The Survey had 35 questions for entrants, excluding the demographic variables.

The table below shows the research Instruments that have been used throughout this research.

Table (1)

Research Instruments

Variables	**Source**	**Items**
TPACK	(Schmidt, Baran, E., Thompson, Koehler, Mishra& Shin, 2009)	17
Teacher Self-Efficacy	(Gaumer Erickson& Noonan, 2018)	5
Perceived ease of use	Davis (1989)	4
Perceived Usefulness	Davis (1989)	4
Intention to Use Technology	Taylor &Todd (1995)	5

To measure TPACK, the scale was developed by (Schmidt, Baran, Thompson, Koehler, Mishra& Shin, 2009) among the 57 items, the researcher selected17 items from TPACK Scale, and the instrument was originally progressed for preserves teachers in elementary teaching. Since the participants in this study are physics teachers that teach physics in international schools, the researcher removed any expression identifying any subject that is not related to physics.

To measure teacher self-efficacy, the scale was developed by (Schwarzer & Colleagues, 1999) among the 30 items the researcher selected 5 items that focused on physics teachers' feelings and their faith in their capability to use virtual labs to teach physics.

To measure perceived usefulness and perceived ease of use, the scale was developed by (Davis, 1989) and the researcher has selected all the 8 items.

Finally, to measure the intention to use technology, the scale was developed by (Todd & Taylor, 1995) and the researcher has selected all the 5 items.

3.5 Validity of the Research Instruments

Validity is an important tool in quantitative research (Ary, Jacobs, Razavieh, & Sorensen, 2006). In this study, the researcher has done two things to check the validity of the instrument.

First, the researcher has selected ten experts to establish the validity of the research instruments. The panel of experts consisted of ten individuals who have experience in different fields related to this research. The first two experts are specialized in English language education, while the other two are specialized in teaching physics and there are two experts, who are specialized in educational technology, also there are two experts who are specialized in Psychology and Arabic and the final two are science and physics coordinators specialists.

Appendix (1 & 2) shows the survey in its initial form that was distributed to the specialists to express their opinion and check the paragraph affiliation and language accuracy. The observations were taken and the appropriate amendments were made.

While Appendix (3) indicates the names and the numbers of the experts' specialties.

Second, to verify the validity, the researcher calculated the correlation coefficient between the items and the dimensions using the SPSS program.

The table below shows the Correlation coefficient between the items and the (TPACK)

Table (2)

Correlation Coefficients between the Items and the (TPACK)

Items	Correlation Coefficient
I know how to solve my technical problems that I face using the VL	0.730
I have the technical skills to use VL.	0.713
I can learn how to use VL easily	0.715
I have enough knowledge of physics.	0.543
I can use scientific ways of thinking.	0.664
I have various ways and strategies for developing my understanding of physics.	0.662
I know how to assess student performance in the classroom.	0.654
I can adapt my teaching style to different kinds of students	0.550
I can use a wide range of teaching approaches in a classroom setting	0.603
I know how to organize and maintain classroom management.	0.594
I can assess student learning in multiple ways	0.616
I can select effective teaching approaches to guide student thinking and learning in physics.	0.681
I am familiar with the VR and am capable of performing and understanding physics experiments using this technique.	0.733

Items	Correlation Coefficient
I can use strategies that combine content, VL and teaching approaches that I learned about in my coursework in my classroom	0.811
I can choose different physics experiments using the VL that enhance the content for my lesson.	0.797
I am thinking critically about how to use VL in my classroom.	0.711
I can teach lessons that appropriately combine physics, VL, and teaching approaches.	0.839

It is noted from the table (2) that there are high correlation coefficients and statistically significant at (0.05 = α). This enhances the validity of the internal consistency of the TPACK dimensions items.

The table below shows the Correlation coefficients between the items and the self-efficacy.

Table (3)

Correlation Coefficients between the Items and the Self-Efficacy

Items	Correlation Coefficient
I am confident that I could deal efficiently with VL	0.903
I have the skills needed to use VL	0.923
I can learn how to use VL easily	0.837
It is easy for me to stick to my aims and accomplish my goals using VL.	0.873
If I face a problem with VL, I usually know what I should do.	0.875

It is noted from the table (3) that there are high correlation coefficients and statistically significant at (0.05 = α). This enhances the validity of the internal consistency of the self-efficacy dimensions items.

The table below shows the Correlation coefficients between the items and the (PEOU).

Table (4)

Correlation Coefficients between the Items and the (PEOU)

Items	Correlation Coefficient
It is easy to learn how to use VL	0.885
It is easy to become skillful at using VL	0.918
It is easy to operate VL ؘ application	0.918
VL is flexible to interact with	0.885

It is noted from the table (4) that there are high correlation coefficients and statistically significant at (0.05 = α). This enhances the validity of the internal consistency of the PEOU dimensions items.

The table below shows the Correlation coefficients between the items and the (PU).

Table (5)

Correlation Coefficients between the Items and the (PU)

Items	Correlation coefficient
VL will enable me to teach physics more easily.	0.874
Using VL will improve my teaching performance.	0.920
Using VL will help me to teach physics effectively	0.889
Using VL will make it easier to achieve my physics tasks	0.904

It is noted from the table (5) that there are high correlation coefficients and statistically significant at (0.05 = α). This enhances the validity of the internal consistency of the (PU) dimensions items.

The table below shows the Correlation coefficients between the items and the (BI)

Table (6)

Correlation Coefficients between the Items and the (BI)

Items	Correlation Coefficient
I would like to use VL in the future If I have a chance	0.924
I would like to use VL in all science fields	0.911
I would like to recommend using VL to other teachers	0.939
I would encourage all science teachers to use VL in their courses	0.949
I will continue using VL in the future	0.917

It is noted from the table (6) that there are high correlation coefficients and statistically significant at (0.05 = α). This enhances the validity of the internal consistency of the BI dimensions items.

3.6 Reliability of the Research Instruments

Reliability is the degree to which a test consistently measuring (Lodico, Spaulding & Voegtle, 2006). A Pilot study has been conducted after receiving the approval from the Ministry of Education in Jordan to test the reliability of the research instruments. First, the researcher conducted a Pilot Study in the second semester 2019/2020 and has randomly chosen an exploratory sample that has been conducted outside the study sample, the sample consisted of ten physics teachers.

Second, the researcher tested the reliability of the instrument by calculating, the Cronbach's alpha coefficient and according to Malhotra(2004), If the result of the Cronbach's Alpha coefficients is equal or more than (60%) that will indicate that the instrument has high reliability.

The table below shows the results of the Cronbach's Alpha coefficients and compares them with the original study.

Table (7)

Summary of the internal consistency of the TPACK, Teacher self-efficacy, Perceived ease of use, Perceived usefulness, and the Intention to use technology variables.

Dimensions	Source	Cronbach Alpha	
		Original study	The current study (Pilot study)
TPACK	Schmidt, Baran, Thompson, Koehler, Mishra& Shin (2009)	0.89	0.929
Teacher self-efficacy	Schwarzer & colleagues (1999)	0.86	0.929
Perceived ease of use	Davis (1999)	0.87	0.923
Perceived usefulness	Davis (1999)	0.90	0.926
Intention to use technology	Taylor & Todd (1955)	0.90	0.959
Overall	-	-	0.973

It is noted from the table (7) that there are high-Reliability coefficients in each dimension of the survey and there are higher than the original studies, Also the overall Cronbach's alpha coefficient of the survey is equal to (0.973) and it is higher than (0.60) and that indicates that the overall survey has a high-reliability coefficient which enhances the accuracy of the study tool, and its suitability for application to achieve the study objectives.

3.7 Procedure:

After the researcher chick the validity and reliability of the measurement scale, the researcher has followed the following methodology, first, the researcher has built an electronic survey in English and Arabic using google forms, then a(101) electronic survey has been distributed by email to the physics teachers who are teaching in various international schools.

Second, the researcher collected, analyzed, and processed the data statistically using the SPSS program, finally, the data has been presented, interrupted, and discussed to come up with the suitable recommendations and proposals.

3.8 Data Analysis:

First, the researcher checks the validity of the instrument by distributing a survey in its initial form to ten specialists to express their opinion and check the paragraph affiliation and language accuracy. Also, the researcher calculated the correlation coefficient between the items and the dimensions using the SPSS program. Second, the researcher checks the reliability of the instrument by calculating Cronbach's alpha coefficients. After checking the validity and the reliability of the instrument a descriptive analysis has been done using the SPSS program. Finally, multiple and linear regression have been conducted to examine the structural relationships between the variables and to check the hypothesis of the study

CHAPTER FOUR

Results

This chapter represents the results of the data analysis for each of the hypothesis after distributing the survey:-

4.1 Data Analysis

Demographic Information:

Table (8) shows the distribution of the individuals in the study according to their demographic information.

Table (8)

Demographic Information

Variables	Levels	Frequency	Percentage %
Age	23-37	45	44.6
	38-52	36	35.6
	Above 52	20	19.8
Total		101	100.0
Gender	Male	52	51.5
	Female	49	48.5
Total		101	100.0
Year of experts	Less than five years	29	28.7
	5-10 years	33	32.7
	Above ten years	39	38.6
Total		101	100.0
Qualifications	Bachelor's Degree	50	49.5
	Master's Degree	31	30.7
	PhD	20	19.8
Total		101	100.0

The percentage of those aged between (23-37) has reached (44.6%), while the percentage of those aged between (38-52) has reached (35.6%), and those who are over (52) their percentages have reached (19.8%). Moreover, the percentage of males have reached (51%) while the percentage of females reached (48%). It is noted that the male ratio is the largest, and the researcher explains the high percentage of physics male teachers due to the nature of physics specialization, whereby physics male teachers desire such kind of specialties more than female physics teachers. Also, teachers who taught physics with less than five years of experience were (28.7%), while teachers who taught physics with experience ranging from (5-10) years were (32.7%), while teachers whose years of the experience exceeded ten years were (38.6%). Also, The percentage of the number of physics teachers with a baccalaureate degree have reached (49.5%), while the percentage of the number of physics teachers with a master's degree has reached (30.7%), and finally, the percentage of physics teachers with a Ph.D. degree reached (19.8%).

4.2 Testing the Study Hypotheses

Hypothesis 1: Physics teachers' TPACK will positively affect teacher self-efficacy.

A simple linear regression was calculated to predict teacher self-efficacy based on physics teachers' TPACK, b = 0.84, t (99) =-1.99, $p<0.001$. A significant regression equation was found ($F (1, 99) = 245.452$, $p<0.001$), with an R^2 of 0.713. Tables ((9), (10), and (11)) show the results of the analysis.

Table (9) Model Summary Between TPACK and Self-Efficacy

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.844	.713	.710	.50372

a. Dependent Variable: Self-efficacy

b. Predictors: (Constant), TPACK

Table (10) ANOVA[a] Results Between TPACK and Self-efficacy

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	62.279	1	62.279	245.452	.000
	Residual	25.119	99	.254		
	Total	87.398	100			

a. Dependent Variable: Self-efficacy

b. Predictors: (Constant), TPACK

Table (11) The Coefficients[a] Between TPACK and Self-efficacy

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.607	.305		-1.989	0.049
	TPACK	-1.160	.074	.844	-15.667	0.000

a. Dependent Variable: Self-efficacy

b. Predictors: (Constant), TPACK

It is noted from the tables ((9), (10), and (11)) that there is a statistically positive effect, with a value of F (245.452) with a significance level (0.00), and this value is statistically significant at (0.05 = α). Also, the tables showed that the value of the correlation coefficient between them is high and equal to (0.844).

Hypothesis 2: Physics teachers' TPACK will positively affect the perceived ease of using virtual labs (PEOU).

A simple linear regression was calculated to predict (PEOU) based on physics teachers' TPACK, b=0.77, t (99) = -0.12, p<0.001. A significant regression equation was found (F (1,99) = 143.229, p<0.001), with an R^2 of 0.591. Tables ((12), (13), and (14)) show the results of the analysis.

Table (12) Model Summary Between TPACK and PEOU

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.769	.591	.587	.58623

a. Predictors: (Constant), TPACK

b. Dependent Variable: PEOU

Table (13) ANOVA[a] Results Between TPACK and PEOU

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	49.223	1	49.223	143.229	0.000
	Residual	34.023	99	0.344		
	Total	83.246	100			

a. Dependent Variable: PEOU

b. Predictors: (Constant), TPACK

Table (14) Coefficients[a] Between TPACK and PEOU

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.041-	.355		-.116-	.908
	TPACK	1.031	.086	.769	11.968	.000

a. Dependent Variable: PEOU

b. Predictors: (Constant), TPACK.

It is noted from the tables ((12), (13), and (14)) that there is a statistically positive effect, where the value of F (143.229) reached the level of significance (0.00), and this value is statistically significant at (0.05 = α). Also, the tables showed that the value of the correlation coefficient between them is high and equal to (0.769).

Hypothesis 3: Physics Teachers' TPACK and perceived ease of use (PEOU) will positively affect the perceived usefulness of using the virtual labs (PU).

A multiple linear regression was calculated to predict (PU) based on their (TPACK and PEOU), a significant regression equation was found (F (2, 98) =81.733, p<0.000), with an R^2 of 0.625. Tables ((15), (16), and (17)) show the results of the analysis.

Table (15) Model Summary Between TPACK, PEOU, and PU

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.791[a]	0.625	0.618	0.53668

a. Predictors (Constant): PEOU, TPACK
b. Dependent Variable: PU

Table (16) ANOVA[a] Results Between PEOU, TPACK, and PU

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	47.083	2	23.541	81.733	0.000[b]
	Residual	28.227	98	.288		
	Total	75.309	100			

a. Dependent Variable: PU
b. Predictors (Constant): PEOU, TPACK

Table (17) Coefficients[a] Between PEOU, TPACK, and PU

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.113	.332		3.355	.001
	TPACK	.006	.147	.004	.038	.970
	PEOU	.731	.107	.787	6.823	.000

a. Dependent Variable: PU
c. Predictors (Constant): PEOU, TPACK

It is noted from the tables((15), (16), and (17)) that there are positive statistically significant effects of (TPACK and PEOU) on (PU), where the value of F is equal to

(81.733) reached the significance level (0.00), and this value is statistically significant at (0.05 = α). Also, the tables showed that the value of the correlation coefficient between them is high and equal to (0.791).

Hypothesis 4: Physics teachers' TPACK, teacher self-efficacy, perceived ease of use (PEOU), and perceived usefulness of technology (PU) will affect intention to use technology (Behavioral Intention (BI) to Use virtual labs).

Multiple linear regression was calculated to predict (BI) based on their TPACK, Self-efficacy, PEOU and PU a significant regression equation were found (F (4, 96) =114.165, p<0.000), with an R^2 of 0.909. Tables ((18), (19), and (20)) show the results of the analysis.

Table (18) Model Summary Between PU, TPACK, Self-Efficacy, PEOU, and BI

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.909[a]	0.826	0.819	0.36387

a. Dependent Variable: BI
b. Predictors: (Constant), PU, TPACK, Self-efficacy, PEOU

Table (19) ANOVA[a] Results Between PU, TPACK, Self-Efficacy, PEOU, and BI

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	60.464	4	15.116	114.165	.000
	Residual	12.711	96	.132		
	Total	73.175	100			

a. Dependent Variable: BI
b. Predictors: (Constant), PU, TPACK, Self-efficacy, PEOU

Table (20) Coefficients[a] Between PU, TPACK, Self-Efficacy, PEOU, and BI

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.661	.238		2.779	.007
	TPACK	-.112-	.100	-.089-	-1.112-	.269
	Self-efficacy	.006	.100	.007	.064	.949
	PEOU	.397	.111	.423	3.578	.001
	PU	.564	.089	.572	6.327	.000

a. Dependent Variable: BI

b. Predictors: (Constant), PU, TPACK, Self-efficacy, PEOU.

It is noted from the tables ((18), (19), and (20)) that there are positive statistically significant effect of (TPACK, Self Eff., PEOU, and PU) on (BI), where the value of F equal to (114.165) reached the significance level (0.00), and this value is statistically significant at (0.05 = α). Also, the tables showed that the value of the correlation coefficient between them is high and equal to (0.909)

CHAPTER FIVE

Discussion of Findings and Recommendations

This chapter includes the discussion of the study conducted by the researcher in addition to the most important recommendations made by the researcher in this study..

5.1 Discussion of Findings

First: Discuss the results related to the first hypothesis which indicates that Physics teachers' TPACK will positively affect teacher self-efficacy.

The researcher found that Physics teachers' TPACK positively affected teacher self-efficacy as the results have shown that there is a statistically positive effect, where the value of F is equal to (245.452) and this value is statistically significant at (0.05 = α). Also, the results have shown that the value of the correlation coefficient between TPACK and teacher self –efficacy is high and equal to (0.844). This finding is in accord with the findings of previous studies (Lee &Tsai, 2010; Akturk& Ozturk, 2019). Physics teachers would benefit from doing workshops and training programs about the virtual labs to improve the level of TPACK.

Second: Discuss the results related to the second hypothesis which indicates that Physics teachers' TPACK will positively affect the perceived ease of using the virtual labs.

Physics teachers' TPACK positively influenced perceived ease of using virtual labs, which supports the previous studies (Alsofyani 2012; Horzum & Gungoren, 2012), as the results have shown that there is a statistically positive effect, where the value of F is equal to (143.229) and this value is statistically significant at (0.05 = α). Also, the results have shown that the value of the correlation coefficient between TPACK and perceived ease of use is high and equal to (0.769). In other words, the researcher founds that physics teachers who have a high level of TPACK will find that using the virtual labs will consider being an easy technology to teach physics, so a virtual labs training should be provided to physics teachers to learn more about using the virtual labs to overcome the unwillingness to learn virtual labs and enable them to know how virtual labs is a very easy technique to teach physics.

Third: Discuss the results related to the third hypothesis which indicates that Physics Teachers' TPACK and perceived ease of use (PEOU) will positively affect the perceived usefulness of using the virtual labs (PU).

The researcher found that Physics Teachers' TPACK and perceived ease of use (PEOU) had a positive effect on the perceived usefulness of using virtual labs (PU), as the results have shown that there is a positive statistically significant effect of (TPACK and PEOU) on (PU), where the value of F is equal to (81.733), and this value is statistically significant at (0.05 = α). Also, the results have shown that the value of the correlation coefficient between TPACK, PEOU, and PU are high and equal to (0.791). This finding is in accord with the findings of previous studies (Alsofyani 2012; Horzum & Gungoren, 2012), so physics teachers need to have more time, facilities, and opportunities to practice on how to use virtual labs until they feel comfortable enough to use virtual labs in their physics lessons and perceive that virtual labs are useful in teaching physics.

Fourth: Discuss the results related to the fourth hypothesis, which indicates that Physics teachers' TPACK, teacher self-efficacy, perceived ease of use, and perceived usefulness of technology will affect intention to use virtual labs.

The researcher found that Physics teachers' TPACK, teacher self-efficacy, perceived ease of use, and perceived usefulness of technology had a positive effect on their intention to use virtual labs.

As the results have shown that there is a positive statistically significant effect of (TPACK, Self Eff., PEOU, and PU) on (BI), where the value of F is equal to (114.165, and this value is statistically significant at (0.05 = α). Also, the results have shown that the value of the correlation coefficient between TPACK, Self -Efficacy, PEOU, PU, and BI is high and equal to (0.909). This finding is in accord with the findings of previous studies (Young JuJoo, Sunyoung Park, & Eugene, 2017; Isaac, Abdullah, Ramayah & Mutahar, 2017) the study will emphasize that TPACK and teacher self-efficacy are the most important factors to increase the intention of using any new technology (JuJoo, Sunyoung Park& Eugene, 2017). Moreover, this study implied that improving TPACK will play a critical role in helping physics teachers to use virtual labs into their educational context and to have an effective learning environment.

5.2 Recommendation

Depending on the results of the study, the researcher presented several recommendations that she reached through her study. First, workshops and training programs about the virtual labs should be done to improve the level of TPACK. Also, virtual labs training should be provided to physics teachers to learn more about using the virtual labs to overcome the unwillingness to learn virtual labs. Decision-makers should use this survey to find out how well the teachers accept the use of virtual laboratories before building virtual laboratories. Moreover, more studies should be done in the future to study how well the teachers accept the use of any technology in different fields and finally more studies should be done in the future to combine new variables to the TAM model.

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Appendix 1

The Survey in its initial form (In English)

Middle East University

College of Educational Sciences

Department of Educational Technology

The second semester 2019/2020

Arbitration Survey

To whom it may concern,

The researcher is conducting a research entitled **"An Investigation of Influencing Physics Teachers' Intention to Use Virtual Laboratory at the International Schools in Amman",** to complete the requirements for obtaining a master's degree.

To achieve the purpose of the study, the researcher prepared a Survey to investigate the factors influencing physics teachers' Intention to use virtual labs and to check the validity of the items, their conformity, and their language formulation, I present to you this survey and I hope that you will read it carefully and delete, adjust and add what you see appropriate.

I thank you for your kind cooperation

Supervisor: Dr. Sani Alkhasawneh **the Researcher: Afaf Abu-Kishk**

Name	
Specialist	
Employer (University/School)	

Appendix 1

An Investigation of Influencing Physics Teachers' Intention to Use Virtual Laboratory at the International Schools in Amman.

The factor	Paragraph affiliation		Language accuracy accurate		The proposed amendment
	Belonged	Not Belonged	Appropriate	Inappropriate	
TK(Technological Knowledge)					
I Know how to solve my own technical problems that I face using the VL					
I have the technical skills to use VL					
I can learn how to use VL easily					
CK(Content Knowledge)					
I have enough Knowledge about physics					
I can use scientific ways of thinking.					
I have various ways and strategies of developing my understanding of physics.					
PK(Prdagogical Knowledge)					
I know how to assess student performance in a classroom.					
I can adapt my teaching style to different kinds of students.					
I can use a wide range of teaching approaches in a classroom setting.					
I know how to organize and maintain classroom management.					
I can assess student learning in multiple ways.					
PCK(Pedagogical Content Knowledge)					
I can select effective teaching approaches to guide student thinking and learning in physics.					
TCK(Technological Content Knowledge)					
I am familiar with the VL and teaching approaches that I learned about in my coursework in my classroom					

TPK(Technological Pedagogical Knowledge)					
I can use stratigies that combine content,VL,and teaching approaches that I learned about in my classroom					
I can choose different physics experiments using VL that enchance the contetnt of my lesson.					
I am thinking critically about how to use VL in my classroom.					
TPACK(Technology Pedagogical and Content Knowledge)					
I can teach lessons that appropriately combine physics,VL,and teaching approaches.					
Self-Efficacy					
I am confident that I could deal efficiently with VL					
I have the skills needed to use VL					
I can learn how to use VL easily					
It is easy for me to stick to my aims and accomplish my goals using VL.					
If I face a problem in VL, I usually know what I should do.					
Perceived ease of use (PEOU)					
It is easy to learn how to use VL					
It is easy to become skillful at using VL					
It is easy to operate VL					
VL is flexible to interact with					
Perceived Usefulness (PU)					
VL would enable me to teach physics more easily.					
Using VL would improve my learning performances.					
Using VL would help me to teach physics effectively					

Using VL would make it easier to achieve my physics tasks easily					
Behavioral Intention (BI) to Use VL					
I would like to use VL in the future If I have Chance					
I would like to use VL in all science fields					
I would like to recommend using VL to other teachers					
I would encourage all science teachers to use VL in their courses					
I will continue using VL in the future					

ملحق رقم (2)

الاستبانة بصيغتها الاولية (باللغة العربية)

جامعة الشرق الأوسط

كلية العلوم التربوية

قسم تكنولوجيا التعليم

الفصل الثاني 2019/ 2020

استبانة التحكيم

الى من يهمه الأمر:

تجري الباحثة بحثًا بعنوان " **دراسة العوامل المؤثرة في نوايا معلمي الفيزياء لاستخدام المختبر الافتراضي في المدارس الدولية في عمان**" كجزء من متطلبات نيل درجة الماجستير.

لتحقيق الغرض من الدراسة، أعدت الباحثة دراسة استقصائية لمعرفة العوامل التي تؤثر على نية معلمي الفيزياء في استخدام المختبرات الافتراضية والتحقق من صحة العناصر ومطابقتها وصياغتها اللغوية، لذلك أقدم لك هذا الاستبيان وآمل أن تقرؤوه بعناية وتقوموا بحذف وتعديل واضافة ما تروه مناسبا.

شاكرة لكم حسن تعاونكم

الباحثة **اشراف**

عفاف أبوكشك **الدكتورة ساني الخصاونة**

الاسم	
التخصص	
مكان العمل (جامعة /مدرسة)	

الملحق (2)

دراسة العوامل المؤثرة في نوايا معلمي الفيزياء لاستخدام المختبر الافتراضي في المدارس الدولية في عمان.

الفقرات العامل	مدى انتماء الفقرة		دقة الصياغة اللغوية		التعديل المقترح
	منتمية	غير منتمية	مناسبة	غير مناسبة	
المعرفة التكنولوجية					
أعرف كيفية حل مشاكلي الفنية التي أواجهها عند استخدام المختبرات الافتراضية					
لدي المهارات التقنية في استخدام المختبرات الافتراضية					
يمكنني تعلم كيفية استخدام المختبرات الافتراضية بكل سهولة					
معرفة المحتوى					
لدي معرفة كافية بالفيزياء					
يمكنني استخدام طرق التفكير العلمية					
لدي طرق واستراتيجيات مختلفة لتطوير فهمي لمادة الفيزياء					
المعرفة التربوية					
أعرف كيفية تقييم أداء الطالب في الفصل الدراسي					
يمكنني تكييف أسلوبي التدريسي مع أنواع مختلفة من الطلاب					
يمكنني استخدام مجموعة واسعة من مناهج التدريس في الفصول الدراسية					
أعرف كيفية تنظيم وإدارة الفصول الدراسية.					
يمكنني تقييم تعلم الطالب بطرق متعددة					
معرفة المحتوى التربوي					
يمكنني اختيار أساليب التدريس الفعالة لتوجيه تفكير الطالب في تعليم الفيزياء					
المعرفة المحتوى التكنولوجي					
أنا معتاد على استخدام المختبرات الافتراضية، وأنا قادر على تطبيق وفهم تجارب الفيزياء باستخدام هذه التقنية.					

المعرفة التربوية التكنولوجية					
يمكنني استخدام الاستراتيجيات التي تجمع بين المحتوى والمختبرات الافتراضية، وأساليب التدريس التي تعلمتها في الدورات الدراسية في الفصل الدراسي الخاص بي.					
يمكنني اختيار تجارب الفيزياء المختلفة باستخدام المختبرات الافتراضية التي تعزز المحتوى الدراسي.					
أفكر بشكل نقدي حول كيفية استخدام المختبرات الافتراضية في الفصل الدراسي.					
علم أصول التدريس في التكنولوجيا ومعرفة المحتوى					
يمكنني تدريس الدروس التي تجمع بشكل مناسب بين الفيزياء والمختبرات الافتراضية، وأساليب التدريس.					
الكفاءة الذاتية					
أنا واثق من أنني أستطيع التعامل بكفاءة مع المختبرات الافتراضية.					
لدي المهارات اللازمة لاستخدام المختبرات الافتراضية.					
يمكنني معرفة كيفية استخدام المختبرات الافتراضية بكل سهولة.					
من السهل بالنسبة لي التمسك بأهدافي وتحقيق أهدافي باستخدام المختبرات الافتراضية.					
إذا واجهت مشكلة في استخدام المختبرات الافتراضية فأنا أعلم بالعادة ما يجب فعله.					
سهولة الاستخدام					
من السهل تعلم كيفية استخدام المختبرات الافتراضية					
من السهل أن تصبح ماهرًا في استخدام المختبرات الافتراضية.					
من السهل تشغيل تطبيق المختبرات الافتراضية.					

من السهل التفاعل مع المختبرات الافتراضية لمرونتها					
فائدة الاستخدام					
المختبرات الافتراضية ستمكنني من تدريس الفيزياء بسهولة أكبر.					
استخدام المختبرات الافتراضية من شأنه تحسين أدائي في التدريس.					
استخدام المختبر الافتراضي سيساعدني في تدريس الفيزياء بفعالية					
استخدام المختبرات الافتراضية سيجعل من السهل تحقيق مهام الفيزياء الخاصة بكل سهولة.					
النية السلوكية لاستخدام المختبرات الافتراضية					
أرغب في استخدام المختبرات الافتراضية في المستقبل إذا كانت لدي فرصة					
أود استخدام المختبرات الافتراضية في جميع مجالات العلوم					
أود أن أوصي باستخدام المختبرات الافتراضية للمعلمين الاخرين					
أشجع جميع معلمي العلوم على استخدام المختبرات الافتراضية في دوراتهم					
سأستمر في استخدام المختبرات الافتراضية في المستقبل					

Appendix 3

A-List of the Names of Referee Arbitrators

Number	Name	Specialization	Workplace
1	Areen Abdulhakeem	Master Degree In English	International Community School
2	Karam Khalil	Bachelor Degree In English	Islamic Educational College
3	Nisreen Hussain	Bachelor Degree In Physics	Amman Academy
4	Ahmad Alasakreh	Master Degree In Physics	Al-Mashreq
5	Dr.Hamzeh Al-Assaf	Ph.D. In Education Technology	MEU
6	Dr.Manal Tawalbeh	Ph.D. In Education Technology	MEU
7	Aseel Awni	Bachelor Degree In Arabic	Al Ridwan School
8	Mirvat Ziyadat	MYP Science Coordinator	Amman Academy
9	Samah Al-Madani	MYP Physics Coordinator	Amman Academy
10	Zeina Qarrain	Master Degree in Phycology	Amman Academy

Appendix 4

The Survey in its final form (In English)

Middle East University

College of Educational Sciences

Department of Educational Technology

The second semester 2019/2020

To whom it may concern,

The researcher is conducting a research entitled **"An Investigation of the Factors Influencing Physics Teachers' Intention to Use Virtual Laboratory at the International Schools in Amman"**, to complete the requirements for obtaining a master's degree.

Given that you are a physics teacher who teaches physics at the international school and having direct contact with your students, Kindly fill out the attached survey by putting a tick sign in the right place in every item of the survey. Note that the answers that you will provide will be treated strictly confidential and will only be used for scientific research purposes.

Thank you for your kind cooperation

Supervisor: Dr. Sani Alkhasawneh   The Researcher: Afaf Abu-Kishk

<u>Part One</u>

Demographic Information:-

Tick the appropriate box.

What is your age?

☐ 23-37

☐ 38-52

☐ Above 52

What is your gender?

☐ Male

☐ Female

Year of experts.

☐ Less than five years

☐ 5-10 years

☐ Above ten years

What is the highest degree level you have completed?

☐ Bachelor's Degree

☐ Master's Degree

☐ Ph.D

Part Two:

The Factors Influencing Physics Teachers' Intention to Use Virtual Laboratory at the International Schools in Amman.

The Factor	Strongly disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree
TK (Technology Knowledge)					
I know how to solve my own technical problems that I face using the VL					
I have the technical skills to use VL.					
I can learn how to use VL easily.					
CK (Content Knowledge)					
I have enough knowledge about physics.					
I can use scientific ways of thinking.					
I have various ways and strategies of developing my understanding of physics.					
PK (Pedagogical Knowledge)					
I know how to assess student performance in a classroom.					
I can adapt my teaching style to different kinds of students.					
I can use a wide range of teaching approaches in a classroom setting					
I know how to organize and maintain classroom management.					
I can assess student learning in multiple ways					
PCK (Pedagogical Content Knowledge)					
I can select effective teaching approaches to guide student thinking and learning in physics.					
TCK (Technological Content Knowledge)					
I am familiar with the VR, and am capable of performing and understanding physics experiments using this technique.					
TPK (Technological Pedagogical Knowledge)					
I can use strategies that combine content, VL and teaching approaches that I learned about in my coursework in my classroom					

I can choose different physics experiments using the VL that enhance the content for my lesson.					
I am thinking critically about how to use VL in my classroom.					
TPACK (Technology Pedagogy and Content Knowledge)					
I can teach lessons that appropriately combine physics, VL, and teaching approaches.					
Self-Efficacy					
I am confident that I could deal efficiently with VL					
I have the skills needed to use VL					
I can learn how to use VL easily					
It is easy for me to stick to my aims and accomplish my goals using VL.					
If I face a problem with VL, I usually know what I should.					
Perceived ease of use (PEOU)					
It is easy to learn how to use VL					
It is easy to become skillful at using VL					
It is easy to operate VL application					
VL is flexible to interact with					
Perceived Usefulness (PU)					
VL will enable me to teach physics more easily.					
Using VL will improve my teaching performance.					
Using VL will help me to teach physics effectively					
Using VL will make it easier to achieve my physics tasks					
Behavioral Intention (BI) to Use VL					
I would like to use VL in the future If I have a chance					
I would like to use VL in all science fields					
I would like to recommend using VL to other teachers					
I would encourage all science teachers to use VL in their courses					
I will continue using VL in the future					

الملحق (5)

الاستبانة بصيغتها النهائية (باللغة العربية)

جامعة الشرق الأوسط

كلية العلوم التربوية

قسم تكنولوجيا التعليم

الفصل الثاني 2019/ 2020

الى من يهمه الأمر:

تجري الباحثة بحثًا بعنوان " **دراسة العوامل المؤثرة في نوايا معلمي الفيزياء لاستخدام المختبر الافتراضي في المدارس الدولية في عمان**" كجزء من متطلبات نيل درجة الماجستير.

نظرًا لأنكم من أعضاء هيئة تدريس مادة الفيزياء تقومون بتدريس الفيزياء في المدرسة الدولية ولديكم اتصال مباشر وتفاعل مع طلابكم، يرجى التفضل بملئ الاستبانة المرفقة عن طريق وضع علامة (/) في المكان المناسب في كل فقرة من فقرات الاستبانة. علما بأن الإجابات التي ستقدمونها سيتم التعامل معها بسرية تامة ولا تستخدم الا لأغراض البحث العلمي.

شاكرة لكم حسن تعاونكم

الباحثة	**اشراف**
عفاف أبوكشك	**الدكتورة ساني الخصاونة**

<u>الجزء الأول:</u>

البيانات الشخصية: -

ضع علامة(/) في المربع المناسب.

العمر:

- ☐ 23 – 37
- ☐ 38 – 52
- ☐ أكثر من 52

الجنس:

- ☐ ذكر
- ☐ أنثى

سنوات الخبرة :

- ☐ أقل من خمس سنوات
- ☐ 5 – 10 سنوات
- ☐ أكثر من عشر سنوات

المؤهل التعليمي :

- ☐ درجة البكالوريوس
- ☐ درجة الماجستير
- ☐ درجة الدكتوراه

الجزء الثاني

دراسة العوامل المؤثرة في نوايا معلمي الفيزياء لاستخدام المختبر الافتراضي في المدارس الدولية في عمان

الفقرات العامل	غير موافق بشدة	غير موافق	لا أدري	موافق	موافق بشدة
المعرفة التكنولوجية					
أعرف كيفية حل مشاكلي الفنية التي أواجهها عند استخدام المختبرات الافتراضية					
لدي المهارات التقنية في استخدام المختبرات الافتراضية					
يمكنني تعلم كيفية استخدام المختبرات الافتراضية بكل سهولة					
معرفة المحتوى					
لدي معرفة كافية بالفيزياء					
يمكنني استخدام طرق التفكير العلمية					
لدي طرق واستراتيجيات مختلفة لتطوير فهمي لمادة الفيزياء					
المعرفة التربوية					
أعرف كيفية تقييم أداء الطالب في الفصل الدراسي					
يمكنني تكييف أسلوبي التدريسي مع أنواع مختلفة من الطلاب					
يمكنني استخدام مجموعة واسعة من مناهج التدريس في الفصول الدراسية					
أعرف كيفية تنظيم وإدارة الفصول الدراسية.					
يمكنني تقييم تعلم الطالب بطرق متعددة					
معرفة المحتوى التربوي					
يمكنني اختيار أساليب التدريس الفعالة لتوجيه تفكير الطالب في تعليم الفيزياء					
المعرفة المحتوى التكنولوجي					
أنا معتاد على استخدام المختبرات الافتراضية، وأنا قادر على تطبيق وفهم تجارب الفيزياء باستخدام هذه التقنية.					
المعرفة التربوية التكنولوجية					
يمكنني استخدام الاستراتيجيات التي تجمع بين المحتوى والمختبرات الافتراضية، وأساليب التدريس التي تعلمتها في الدورات الدراسية في الفصل الدراسي الخاص بي.					
يمكنني اختيار تجارب الفيزياء المختلفة باستخدام المختبرات الافتراضية التي تعزز المحتوى الدراسي.					
أفكر بشكل نقدي حول كيفية استخدام المختبرات الافتراضية في الفصل الدراسي.					

علم أصول التدريس في التكنولوجيا ومعرفة المحتوى					
مناسب بين الفيزياء يمكنني تدريس الدروس التي تجمع بشكل والمختبرات الافتراضية، وأساليب التدريس.					
الكفاءة الذاتية					
أنا واثق من أنني أستطيع التعامل بكفاءة مع المختبرات الافتراضية.					
لدي المهارات اللازمة لاستخدام المختبرات الافتراضية.					
يمكنني معرفة كيفية استخدام المختبرات الافتراضية بكل سهولة.					
من السهل بالنسبة لي التمسك بأهدافي وتحقيق أهدافي باستخدام المختبرات الافتراضية.					
إذا واجهت مشكلة في استخدام المختبرات الافتراضية فأنا أعلم بالعادة ما يجب فعله.					
سهولة الاستخدام					
من السهل تعلم كيفية استخدام المختبرات الافتراضية					
من السهل أن تصبح ماهرًا في استخدام المختبرات الافتراضية.					
من السهل تشغيل تطبيق المختبرات الافتراضية					
من السهل التفاعل مع المختبرات الافتراضية لمرونتها					
فائدة الاستخدام					
المختبرات الافتراضية ستمكنني من تدريس الفيزياء بسهولة أكبر.					
استخدام المختبرات الافتراضية من شأنه تحسين أدائي في التدريس.					
استخدام المختبر الافتراضي سيساعدني في تدريس الفيزياء بفعالية					
استخدام المختبرات الافتراضية سيجعل من السهل تحقيق مهام الفيزياء الخاصة بكل سهولة.					
النية السلوكية لاستخدام المختبرات الافتراضية					
أرغب في استخدام المختبرات الافتراضية في المستقبل إذا كانت لدي فرصة					
أود استخدام المختبرات الافتراضية في جميع مجالات العلوم					
أود أن أوصي باستخدام المختبرات الافتراضية للمعلمين الاخرين					
أشجع جميع معلمي العلوم على استخدام المختبرات الافتراضية في دوراتهم					
سأستمر في استخدام المختبرات الافتراضية في المستقبل					

Appendix 6

Facilitate the Mission Book to the Ministry of Education from the Middle East University

جـامـعـة الـشـرق الأوسـط
MEU MIDDLE EAST UNIVERSITY
Amman - Jordan

مكتب رئيس الجامعة
President's Office

الرقم: در/خ/1199/23
التاريخ: 2020/03/03

معالي الدكتور تيسير النعيمي الأكرم
وزير التربية والتعليم
عمان- المملكة الأردنية الهاشمية

تحية طيبة وبعد،

فيسعدني أن أبعث لمعاليكم بأطيب التحيات وأصدق الأمنيات، راجياً إعلامكم أن الباحثة **عفاف عبدالحكيم عوني ابوكشك** تقوم بإجراء دراسة ميدانية بعنوان: (An Investigation of the Factors Influencing Physics teachers' Intention to use Virtual Laboratory at the International schools in Amman) استكمالاً لمتطلبات الحصول على درجة الماجستير في تكنولوجيا المعلومات والاتصالات في التعليم من جامعة الشرق الأوسط.

يرجى التكرم بالإيعاز للمدارس **الخاصه الدولية** بتسهيل مهمة تطبيق الباحثة لأدوات دراستها؛ وذلك من أجل الإسهام في تحقيق أهداف الدراسة، والوصول إلى نتائج دقيقة تهم التربية والتعليم.

ونحن إذ نشكر معاليكم على كل تعاون واهتمام تقدمونه في هذا الشأن، ونؤكد أن المعلومات التي ستحصل عليها الباحثة ستبقى سرية، ولن تُستخدم إلاّ لأغراض البحث العلمي فقط .

وتفضلوا معاليكم بقبول فائق الإحترام والتقدير...

رئيس الجامعة
3.3.2020
أ.د.محمد محمود الحيلة

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