Challenges of deploying one-to-one Laptop Initiative in United Arab Emirates High Schools.

دراسة حول تحديات نشر مبادرة الكمبيوتر المحمول واحد إلى واحد في المدارس الثانوية لدولة الإمارات العربية المتحدة.

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A dissertation submitted to fulfill the requirements for the degree in
MSc in Information Technology Management

Faculty of Engineering & IT

Dissertation Supervisor

Dr. Sherief Abdallah

December 2015

DISSERTATION RELEASE FORM

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Challenges of deploying one-to-one Laptop Initiative in United Arab Emirates High Schools.

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ABSTRACT

One of the most recent educational technology that contributes to the improvement of the educational system in UAE high schools is one-to-one laptop initiative. The predicted results of this research were to determine the one-to-one laptop initiative challenges encountered, and to what extent it affects teachers and students at DAT government school in UAE. The case study focuses on two challenges: professional development and technical support assistance. Research conducted qualitative and quantitative approaches to answer two-research questions. The approaches include teachers and students' online questionnaires, grade 10, 11 and 12 students' marks observation and interviews with teachers and students when needed. Research results revealed that professional development presence is important in such technology deployment as it has a huge impact on teachers' preparation level, which affect students' performance and outcome in classroom. Moreover, technical support assistance involvement is essential to ensure the success of one-to-one laptop deployment and to gain the maximum benefit for the sake of teaching and learning processes in the school. The research findings suggest more studies that need to be conducted in type of training workshops that serve the exact teaching requirement and more details on technical support specifications that school should have to adopt any new education technology in the future.

ملخص

تعتبر مبادرة الكمبيوتر المحمول (واحد إلى واحد) إحدى أحدث التقنيات التعليمية التي ساهمت في تحسين النظام التعليمي للمدارس الثانوية في دولة الإمارات العربية المتحدة. تضمنت نتائج البحث حول مبادرة (واحد إلى واحد) التحديات الناجمة عن استخدمها في النظام التعليمي، وإلى أي مدى قد تؤثر هذه التقنية على المعلمين والطلاب تحديدا في مدرسة دبي للتكنولوجيا التطبيقية في دولة الإمارات العربية المتحدة. تركز الدراسة على تحديين اثنين: التطوير المهني، ومساعدة الدعم التقني. تضمنت هذه الدراسة المنهج الكمّي والمنهج النوعي للإجابة عن سؤالين محوريين لهذا البحث، حيث اشتملت على استبيانات للمدرسين والطلاب عبر شبكة الانترنت، ومراقبة درجات طلاب الصفوف 10 و 11 و 12، و مقابلات مع المعلمين والطلاب. وقد كشفت نتائج البحث أن التطوير المهني مهم جدا في تطبيق هذه التكنولوجيا، مما يؤثر على مستوى استعداد المعلمين، أداء الطلاب ونتائجهم الصفيّة. وعلاوة على ذلك، فإن وجود الدعم الفني ضروري لضمان نجاح مبادرة (واحد إلى واحد)، والحصول على الفائدة القصوى للعمليّة التعلّمية في المدرسة. وتشير نتائج البحوث إلى ضرورة إجراء مزيد من الدراسات وورشات العمل التدريبية التي تخدم المتطلبات الدقيقة للتعليم، ومزيد من التفاصيل حول مواصفات الدعم التقني الضرورية في المدرسة لاستقبال تكنولوجيا التعليم الجديدة في المستقبل.

DEDICATION

This Dissertation dedicated especially to my parents

who always supported and motivated me to achieve my

goals in life.

ACKNOWLEDGMENT

First, I would like to express my deepest graduates to my supervisor Dr. Sherief Abdallah for the continuous support during the period of my Master's study. His motivation, patience, guidance and immense knowledge all aided in making things run as smooth as possible.

Beside my supervisor, I would like to thank DAT-Instructional Technology Manager- Mr. Shadi Ayoub, DAT assessment Department and DAT School Management for providing me with all the required data and information that needed for my study.

Finally, Special Thanks for my father who was the first motivator to complete my Master study and because of him I have gained ample experience that would hopefully aid me at work. This experience will certainly be a long life learning one.

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CHAPTER 1: Introduction

1.1. Overview

21st century working skills demand education systems to integrate latest educational technology tools in teaching and learning practices. Such integration improves the education produces knowledgeable and skilled generation that have the ability to keep up with recent work technologies. Therefore, educational technology integration implemented as an initiative and solution to improve school education experience (Bebell, 2005).

Recently, it has been witnessed that there is a significant increase in one-to-one laptop initiative implementations in schools teaching system. The term "one-to-one" refers to ratio of computing devices per student is 1:1 so that each student provided with computer (Penuel, 2006; Warschauer, 2006; Zucker & McGhee, 2005). There are many other definitions of one-to-one laptop, which can be summarized in general as teachers and students are provided with a laptop and other supportive technology tools anywhere and anytime to support and improve the education instructions.

With recent trend of using laptop initiative in high schools as educational tool all over the world. United Arab Emirates (UAE) is one of the Arab countries that follows the same trend. The UAE government has dedicated and is highly supporting the adoption of latest educational technology tools for high schools in the region.

Dubai Applied Technology (DAT) High School, which is located in the emirates of Dubai, is one of the first high schools in UAE that deployed one-to-one laptop initiative in its education system. DAT High School established in 2005, which offers Career-based Technical Education (CTE) in English at the secondary level to prepare Arab local youth male students to be strong and confidant future leaders in technology area. DAT School is just concerned with teaching grades from 10 to 12.

In 2008, DAT school management decided to integrate computer technology (one-to-one laptop) in the classroom as teaching and learning tool in the beginning of (2009/2010) academic year. An agreement have been signed between DAT school management and computer software vendor (Apple Company) to establish technology knowledge base and practice to all DAT end-users.

Each teacher and student were handed an Apple Macbook Pro laptop. Traditional classroom transformed into computerized multimedia classroom with wireless connectivity facility. According to the agreement Apple vendor hired in house technical support technician to repair and maintain Apple laptop hardware issues.

In this dissertation, I want to study the positive and negative factors that affected the success of the one-to-one laptop initiative in DAT schools. Bebell & O'Dwyer (2010) found in other research studies that the successful and effective use of the laptop technology depends mainly on teachers and program support. Essentially, teachers' technology knowledge, skills and experiences in this field border the attitude to accept laptop implementation as new teaching tool in the classroom environment. Accordingly, educators around the world believe that educational technology tool should be designed to eliminate the negative impact on students' performance and achievement when the integration occurs in teaching and learning practices (Roblyer, 2006).

Another success factor of laptop program is the importance to place technical support before laptop initiative starts (Hall & Elliott, 2010). Technology leaders should work with educators to understand the technical issues that occur and affect the implementation of one-to-one laptop initiative. Bebell and Kay (2010) reported that the poor management and oversights on one-to-one school technology might affect the managed environment among teachers and students. As they depend on reliable network environment for one-to-one laptop to access online resources (Penuel, 2006). It is substantial for technology leaders to understand the required technical infrastructure specifications around networking (Flanagan & Jacobsen, 2003), to establish school reliable infrastructure and provide continues technical support. They also clarified that technology leaders might not be able to understand fully the infrastructure options for that they need to rely on school technicians to control and deploy network restrictions to ensure the school network

reliability. Technical support presence assists to eliminate the technical hardware and software issues related to the use of the laptops in school. These factors are critical in deploying one-to-one laptop initiative in the school system.

1.2. Background

DAT School curriculum developers provided teachers and students with digitized books and studying materials based in their laptop system. Students start to practice the new learning system through using Microsoft Office Suit (word, excel and power point) to take notes, to prepare assignments and projects. Laptops facilitate in-house email system to offer communication system that connect all school end-users with each other. Teachers who were have technological experience and skills started to use their laptop and smart boards in the classroom. Teachers were using school software applications, which required in their teaching such as Students School System Attendance to take student class attendance.

Laptops were prepared with supportive software applications to fulfil the school and curriculum instructional requirement. As teachers and students are familiar with Windows Operating System. Therefore, DAT management installed dual Operating systems in teachers and students MacBook Pro laptops.

1.3. Statement of the Problem

One-to-one laptop initiative was introduced in DAT School in (2009/2010) academic year without any proper technical support plan and adequate preparation for teachers and students. Data collected of this research study determined to disclose the challenges encountered and the impact of these challenges on one-to-one laptop project goals achievement.

1.4. Purpose of Study

The purpose of this research is to investigate one-to-one laptop challenges on teachers and students from first year (2009/2010) of deployment and (2013/2014) after four years.

This research is designed to examine two major challenges: professional development status and technical support. The examination is followed by the impact of these challenges have on teachers' preparation level to use the initiative in the classroom and students' performance and outcome.

1.5. Research Question

Two main questions were conducted in this research:

Research Question 1: What are the effects of professional development and technical support in deploying one-to-one laptop initiative?

Research Question 2: Does the teachers' knowledge of technology affects students' performance and outcome?

1.6. Significance of the Research

In the educational field, the laptop is considered as instructional tool, which used to formulate the teaching and learning in technological way. For this reason, teachers and students spend a lot of time using software applications and Internet resources to serve the education purpose. Minor number of studies in Arab region conducted to investigate the implementation of one-to-one laptop initiative project. The main objective of those studies are to study how much such initiative cost and the suitable project budget. This research is significant because it contributes to a developing research area and provides insight into one-to-one two major challenges (professional development and technical support) that impact teachers and students in classroom and their instructional preparation to use the laptop as the only education tool in the school. In addition, this research offers awareness for technology leaders in school management to the importance of preparing and training teachers and students and the technical support before the deployment of one-to-one laptop in school environment.

1.7. Research terms Definition

<u>Professional Development</u>: is a process that incorporates a comprehensive and intensive method to improve and increase the teachers' instructional capabilities using training workshops opportunities to rise students' achievements.

<u>Technical Support</u>: provides assistance for laptop end-users through fixing technical issues and maintaining school infrastructure, providing software and replacement of hardware issues.

1.8. Organization of the Research

This research is divided in to five main chapters:

- **Chapter One:** Describes background of the problem statement, investigation purpose, research questions, Significance and limitation of the study.
- **Chapter Two:** Reviews related literatures where a description of computing technology integration in education field and one-to-one technology challenges impact on teachers and students in classroom worldwide.
- **Chapter Three**: Identifies the methodology that researcher deigned to collect data from the participants on the effect of initiative challenges.
- **Chapter Four:** Reports data collection results and the analyses of the findings from two academic years where teachers and students used one-to-one laptop.
- **Chapter Five:** researcher concludes this chapter with implications on study analysis results followed by recommendations and suggestion of further studies.

1.9. Limitation

This research encountered several limitations. Because of DAT School confidentiality policy assessment unit could not disclose with the researcher students' subject martials marks for first year of deployment and through the rest of academic years. The unit provide only the students' passing percentage with no further details. Teachers who participated in (2009/2010) survey are not the same teachers who participated in

(2013/2014) survey only 14 teachers who are old in school system from (2008/2009) and (2009/2010) did both surveys. It would be more convenient if the survey conducted in every academic year for more clear results. School support technician was not fully involved in one-to-one laptop deployment because of that he could not provide the researcher with technical details of the deployment.

CHAPTER 2: Literature Review

Reasonable research studies exists exploring one-to-one laptop initiative deployment and the challenges that teachers and students faced using one-to-one technology in classroom. Rapid growth and development of one-to-one computing initiative affect negatively in producing research studies with appropriate procedures (Lei & Zhao 2008). Many resources contributed to develop this literature review such as books, articles, journals and press conferences. The review provides background on the technology integration in education and one-to-one laptop initiative.

2.1. Technology Integration in Education

21st century demand organizations to employ new generations that have essential technology skills (Ertmer & Ottenbreit 2010). Thus, educational foundations need to be prepared to transform teaching and learning methods and process through using technology recourses such as computers, laptops, smart phones and interactive boards. Christensen (2002) states that U.S. Congress Office of Technology Assessment (OTA, 1995) reported one of the most significant steps nation can take is to incorporate technology effectively into teaching and learning process to continue investments in educational technology. Furthermore, for the last 20 years extensive investments have been done for educational technology, which has hug influence in teachers and students daily life routines (Bebell, Russell & O'Dwyer 2004) and (AL-Bataineh & Brooks 2010). Therefore, it is substantial in technology integration to ensure the smooth transformation from industrial to information age within the educational systems (Duffy & Reigeluth 2008).

Hew and Brush (2007, p. 224) claim that "There is no clear standard definition of technology integration in K-12 schools". Cuban, Kirkpatrick and Peck (2001) demonstrated technology integration in two levels: low level use - where students use computers in classroom for internet searches and high level – students use the computers

for collecting , interpreting information for projects and preparing presentation. Other concept for technology integration clarified as how teachers used technology to improve familiar teaching activities, and what changes that made on these activities as a result of this use (Hennessy, Ruthven, & Brindley 2005). In other hand, Lim et al. (2003) define technology integration in terms of how teachers are using technology to develop students' learning and thinking skills. Regardless the differences from the statements above with no clear definition of technology integration; researchers main viewpoint was using of computing devices in instructional field.

A form of technology integration in education is using computers as a loot that revolutionize teaching and learning process. Early in 1980s, small number of schools started to use one or two microcomputers (Roblyer & Edwards 2000 cited in AL-Bataineh & Brooks 2010); by the end of the decade, secondary schools in developed countries were equipped with computers as new education tool (Pelgrum & Schipper 1993). Goddard (2002) states that 1994 Educate America permits state to integrate technology into school curriculum to improve student-learning achievements. In recent year "information age", motivate the integration of computer in to education and instructional system as essential tool to reform students learning (Eteokleous 2008). Adding technology in classrooms facilitate a tool of 21st century for the teachers (Machado & Chung 2015).

2.1.1. Advantages and Disadvantages of Integrating Technology in Education

Technology in education plays a significant role in preparing youth to achieve a successful practical life and enhancing teachers teaching skills and strategies through using recent educational technology tools. Besides, the advantages that educational technology offer there are also some disadvantages in implementing this technology in classroom. Bebell (2005) clarifies that one-to-one technology implementation enhance the relationship between teachers and students and increase students' motivation. Achacoso (2003) states that the main advantages of adopting technology is to improve:
- Efficiency and access to information.
- Facilitate learning through cognitive processes.
- Following up with the latest technology.

- Adoption flexibility for individual in learning.
- Development of using the internet for business skills.

Moreover, students shown an improvement in the quality of their work learning practice and understanding (Silvernail & Lane 2004).

In other hand, there are still some disadvantages and limitations. Gips, DiMattia and Gips (2004) identified that educational technology tools increases educational costs and harm the impartiality of education. Teachers and students do not have technology background and they do not have a proper training on how to use the technology faced difficulties to adapt the new technology, which affect the education performance (lai & Kristonis 2006).

2.2. One-to-One Initiative in U.S

Recently as computer initiative considerably increased in the schools (Akker, Keursten & Plomp 1992), one-to-one computing project rapidly expand across high schools and universities. One-to-one means providing each teacher and student a computer device with latest software applications and with or without internet access anytime and anywhere. The movement of one-to-one computer access founded by Apple Classrooms of Tomorrow (ACOT) project that provide K-12 teachers and students with digital teaching and learning one-to-one access to promote education environment improvement (Donovan, Hartley & Strudler 2007). Beside Apple Inc., other companies contributed the creation of one-to-one initiative environment such as Dell, IBM, Microsoft and HP.

According to Lei, Conway & Zhao (2008, p. x) with the fast growing of one-to-one project United States implemented this project in 33 states. In 2002, Maine was the first state that start the one-to-one initiative in the classrooms by signing 4 years contract with Apple Computer Inc. that cost 37.2 million dollars, to provide the schools with suitable infrastructure and iBook for 239 public schools. Followed by state of Michigan that spent 30 million dollars for issuing laptops and (PDAs) Personal Digital Assistance devices for 15 schools districts. In 2004, Texas's Technology Immersion Project (TIP) funds the state for deploying one-to-one computing and all needed technology tools that support the 21st century learning for almost 25 schools. In 2006, South Dakota governor offered 13

million dollars to provide each high school students with a laptop. There are many other examples of the one-to-one laptop fast expansion in U.S.

2.3. One-to-one laptop in Education

With the era of World Wide Web (WWW) new computers and portable devices has been developed especially to serve education. Hadeed (2000) states that almost all the classrooms in U.S are connected to the Internet. With the increase of educational tools and online resources that support teachers and students, it convenient to integrate digital technology in to teaching and learning processes in order to transform education to better shape and access valuable resources (Penuel 2006) and (Valiente 2010). Utilizing technology tools in the classroom incorporate the communication between teachers and students with their colleges (Abbad, Morris and de Nahlik 2009). Using laptop as education technology tool helps teachers to prepare their lessons and unitized online recourses in creative way, also facilitate to student their assignment, projects with no time through exchanging online documents and files between other teachers and students. However, the integration will not complete if teachers and students are not knowledgeable enough and with no adequate technical support to use the new technology tool in the classroom.

2.3.1. Professional Development

Professional development considered as very essential process of gaining technology skills, experience and qualification for teachers. Reinen and Plomp (1993) and Burke (2006) state that teachers' professional development ensure the success of instructional technology tools integration and enhance students' performance and achievements. Initially, most of teachers' professional development programs attend to establish basic computer skills courses for developing teachers to fulfil the technology goal, which not prepare teachers to use the technology in educational context (Vannatta & Beyerbach 2000). Therefore, teachers who participate in professional development activities that aligned with school curriculum are more likely to integrate technology in their instruction (Kanaya, Light & Clup 2005). Collaboration of teachers and their colleagues within professional development enhance their learning and improve facilitating technology to

their students (Frank, Zhao & Borman 2004; Riel & Becker 2000). Louis and Marks (1998) found that teacher professional development with the social support have positive affect on student performance. Furthermore, according to Russell and Bradley (1997) study it is important to have professional development follow up plan after the integration for teachers to ensure the teaching improvement.

2.3.2. Technical Support

Many studies refer to the importance of technical support availability. Penuel (2006) found that technical infrastructure is substantial factor to support the technical issues teachers faced in using the technology in the classroom. According to Silvernail and Lane (2004) study almost 70% of the teaches who participated in the survey study (Teacher Survey, Fall 2003) reported the need of more direct technical support, one teacher said:

"I feel that in our particular school, the lack of technical support on a regular basis has truly hindered the full use and potential of these computers in our school. I wish the state could mandate some guidelines for schools to have an in-house professional. We have run in to so many technical problems that it seems almost pointless to use the computers. Our building really needs someone here on a weekly basis to provide technical support"

Moreover, Blumenfeld et al. (2000) claim that difficulties of finding adequate hardware and software support maintains recourses reduce teachers' ability to use technology with students. Penuel (2006) found that unstable wireless network is another technical issue that teachers suffered from in integrating technology in the classroom. Further, limited access to technical support staff in school may delay the technology integration into curriculum. Finally, it is sufficient to involve technical assistance in the initial phase and implementation of technology program (Grossman et al. 2002).

CHAPTER 3: Research Methodology

The focus of this descriptive research is to examine two main challenges of one-to-one laptop initiative in the classroom mentioned in chapter one. The research collected rang of data to gain clear understanding on the impact of those challenges from multiple perspectives. Therefore, the researcher suggested using mixed method that allowed using of quantitative and qualitative approaches to explore teachers' and students' viewpoints and study the impact of these challenges on teachers' preparation level and the effect on students' class performance/outcome. Mixed method used to gather rich and create clear understating of participants' perceptions.

3.1. Research Design

Investigation development went through four stages. First, second and third stages come under quantitative approach and fourth stage comes qualitative approach. The stages are:

First stage: DAT School curriculum unit conducted a survey to evaluate the impact of professional development on teaching and learning practices and technical support in school at the end one-to-one laptop deployment year. Researcher used the same survey after four years of deployment with some minor modifications in it.

Second stage: researcher prepared a survey for students to investigate the impact of teachers' technology knowledge and skills level in the classroom, role of school technical support and the influence of one-to-one laptop in their studies.

Third stage: collect students' passing percentages form assessment department to explore the impact of using laptops in classroom and monitor if any changes in students passing.

Fourth stage: observations and interviews conducted for teachers and students.

3.2. Population of the Study

This study selected DAT high school teachers and students. The number of population from teachers who participated in curriculum unit survey was 60 out of 74 and who participated in researcher's survey were 44 out 63,also the students who participated in researcher were 41 out of 142 from grade 10, 23 out of 190 from grade 11 and 60 out of 177 from grade 12.

3.3. Instrumentation

Three instruments were applied to collect data from the participants in this study: teacher and student surveys, students passing percentage table and interviews with teachers and students. The researcher selected to use these instruments in order to have accurate data. The students passing percentages collected from assessment department for seven academic years from (2007/2008) until (2013/2014), researcher created a tool to present the data clearly for grade 10, 11 and 12 (see appendix A). The tool is a simple table format where the grades and academic years are presented.

In (2009/2010), DAT curriculum department decided to create a survey for teachers who experienced one-to-one laptop initiative for the first time, to evaluate and examine teachers' technology knowledge, skills, attitude and needs using the new technology tool in their classrooms that facilitate learning outcomes. The survey started with initial section that disclose the survey purpose for teachers. It must be structured in a way that answers the research questions and let the respondents understand the questions purpose as researcher planned (Robson, 2002). For that, survey consists of four main questions sections, which are Demographic Questions, Teacher Professional Development, Technical Support / Infrastructure and Students Outcomes (see appendix B). Table 3.1 below describes each survey section.

Survey Sections	Section discretion
Section 1: Demographic Questions	Teacher: Gender, Age, Grade-teaching and Years of experience.
Section 2: Teacher Professional Development	Four questions on teachers professional development.
Section 3: Technical Support / Infrastructure	Four questions on teachers satisfaction towards technical support in the school.
Section 4: Students Outcomes	A question with five sub-questions on students' performance in five skills.

Table 3.1: Teacher survey section discretion

The same curriculum survey used with minor customization that applied by researcher to suite the study goal, which falls in (2013/2014) academic year (see appendix C).

Researcher prepared students' survey to aid the answering of research questions. The survey contains seven closed-ended questions. The seven questions related to student laptop usage, teacher knowledge of using the laptop, student attitude toward using laptop in the classroom and student satisfaction on school technical support (see appendix D).

3.4. Data Collection Methods

The researcher collected data from:

1. Curriculum department: provides researcher with the survey conducted in (2009/2010) with the results in Microsoft excel sheet sent it by email.
2. Assessment department: provides researcher with students passing percentage from (2007/2008) until (2013/2014).
3. Online survey: researcher used an online survey software (www.questionpro.com) for teacher survey (2013/2014) and student survey.
4. Interviews: researcher interviewed teachers and students to clarify some uncertain information and data.

4.5. Data Preparation

Researcher used Microsoft Excel application to gather and analyze all the data: teacher survey (2009/2010), teacher survey (20013/2014), student survey (2013/2014) and students passing percentages. Descriptive statistic method used to analyze the collected data.

CHAPTER 4: Data Analysis

This chapter demonstrates the results of the data analysis that collected from various recourses. The data collected and then processed to answer the two research questions presented earlier. A fundamental goal drove the data collection and the subsequent data analysis. This goal created to develop knowledge base on the importance presence of professional development, technical support assistance before deploying any new education technology in high schools. The data were collected from online surveys teachers obtained prior at the end of academic year of deploying one-to-one laptop and after 4 years of deployment, in addition, interviews and investigation to identify some ambiguous data. Furthermore, findings from students' online survey and passing percentage.

4.1. Analyzing Teachers' Survey.

4.1.1. Demographic data

Table 4.1 shows the overall teachers' responses from two surveys: first survey occurred at the end of academic year (2009/2010) when one-to-one-laptop deployed first time and second survey conducted after 4 years of the deployment (2013/2014).

Academic year	No. Responses	No. all Teachers
2009/2010	60	74
2013/2014	44	63

Table 4.1: number of teachers responses.

Figure 4.1 reflects teachers' participated age and gender for two academic years. In (2009/2010) academic year, (60%) male and (40%) female teachers completed the survey. The majority of teachers' age was between 30-39 years old (60%), (35%) between 40-49 years old and (5%) between 20-29 years old. Besides, in (2013/2014) academic year, 27 teachers were male and 17 were female, it's obvious that DAT school management preferred to hire male teachers. In that year (50%) of teachers' age were between 40-49 years old, the reason behind that DAT School changes its hiring strategy

from hiring young teachers to hire experienced teachers/older teachers in education field as illustrated in Figures 4.2 and 4.3.
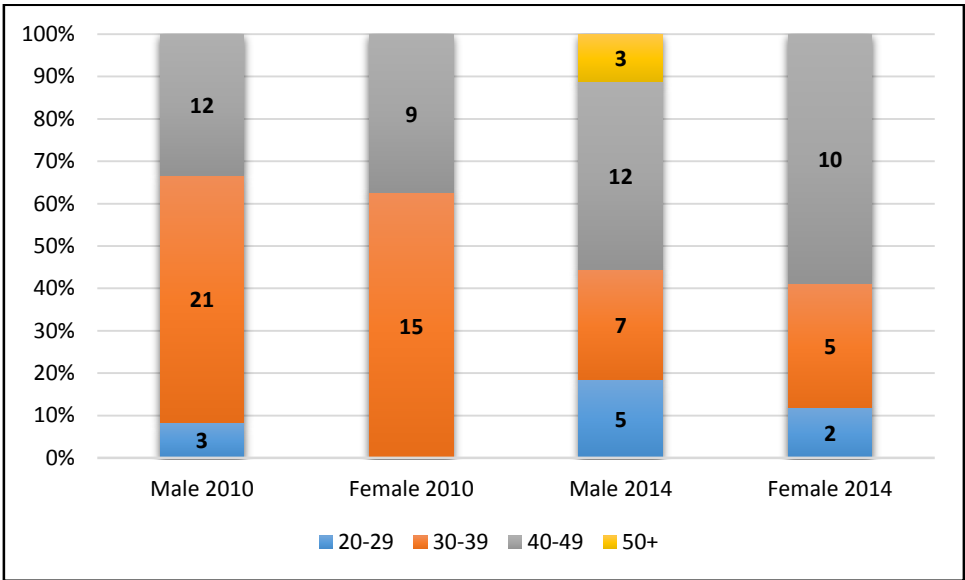

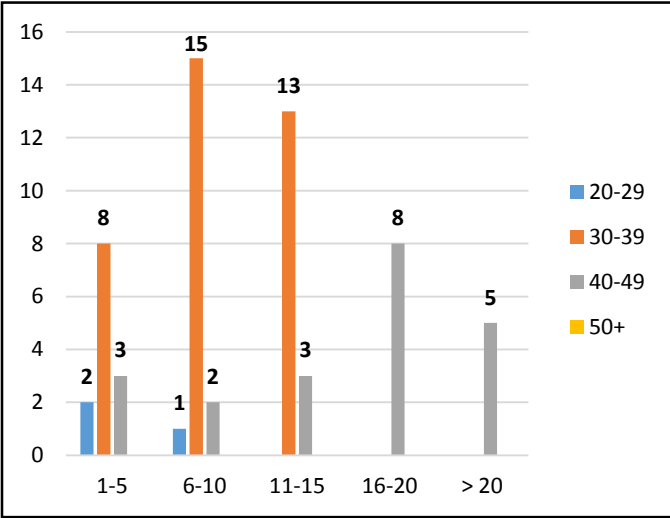Figure 4.1: Age of Respondents broken out by Gender.
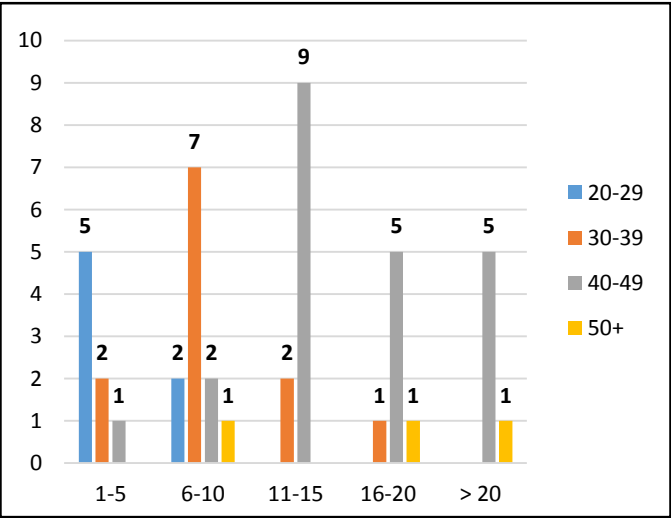

Figure 4.2: (2009/2010) Teachers Experience.

Figure 4.3: (2013/2014) Teachers Experience.

4.1.2. Teachers' Professional Development.

4.1.2.1. Professional Development before and during deploying one-to-one laptop.

A comparison made for professional development (PD) when teachers start using one-to-one laptop in first deployment year (2009/2010) and after 4 years (2013/2014) which shown in Figure 4.4. (81.67%) of teachers declared that there were no adequate PD training before the deployment in (2009/2010). In other hand, (70.45%) of teachers stated that they had participated in PD training for deployment in beginning of academic year (2013/2014). Percentage calculated according to the no. of teachers' responses mentioned earlier in Table 4.1.

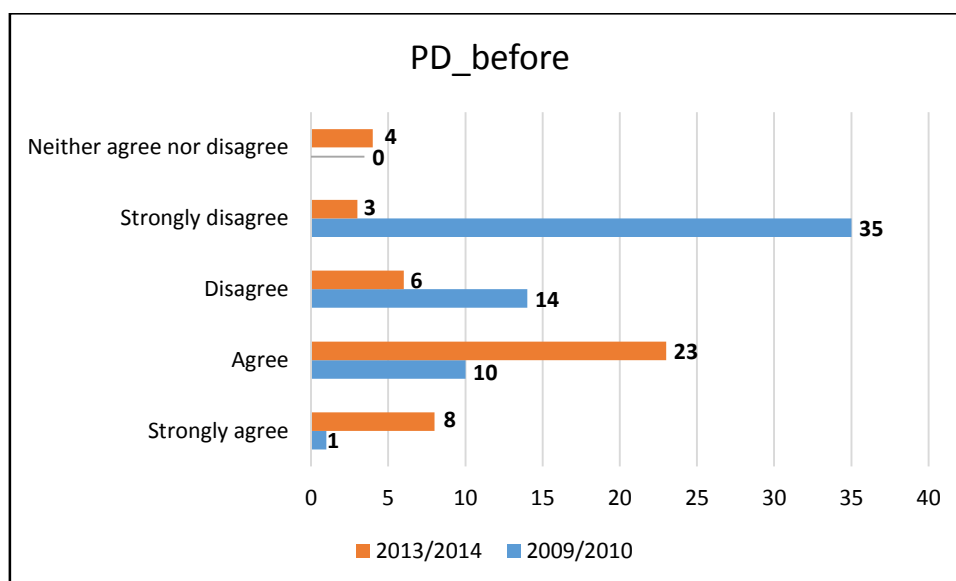Figure 4.4: PD_Before Deployment

Moreover, another compassion made for ongoing PD during the academic years mentioned previously. Figure 4.5 illustrates that 48 teachers (80%) did not provided with professional development training during the initiative deployment in (2009/2010). However, 33 teachers (75%) agreed that they got professional development training during the school academic year (2013/2014).
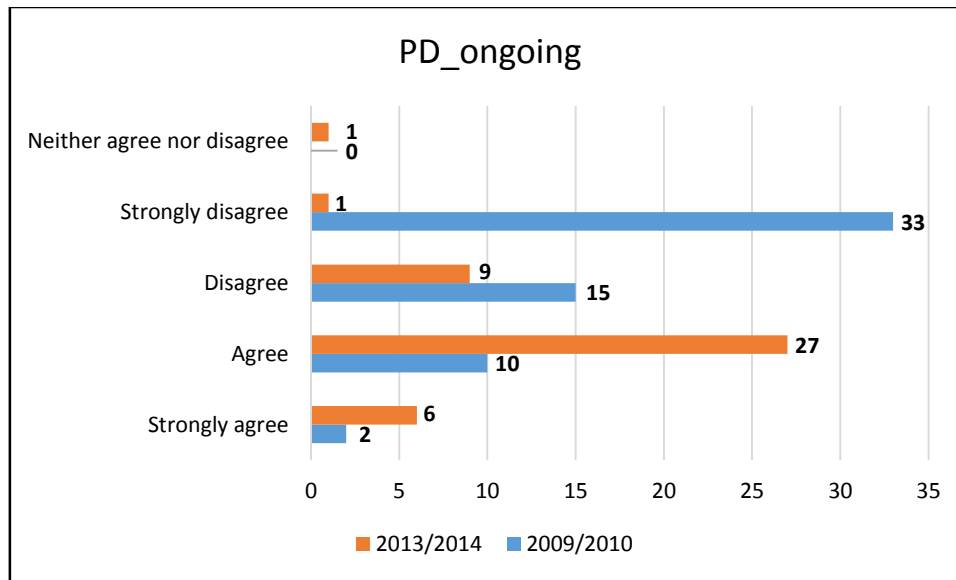
Figure 4.5: PD_Ongoing through Academic Year.

In (2013/2014) survey results showed that 13 teachers did not get training before the deployment in Figure 4.4. In addition, 11 teachers did not attend the ongoing training during the academic year Figure 4.5. An investigation conducted to reveal the reason behind those results. It is obvious that teachers' age and the huge traditional teaching experience played substantial role, which make it difficult on eight teachers who were more than 40 years to accept and be engaged in any activities related to one-to-one initiative. Two teachers who did not attend the training before the academic year started were engaged to other school activities but they got the ongoing training that implemented during the academic year. Three teachers who did not attend the before and ongoing training were new to the school system as they joined the school in the middle of the (2013/2014) academic year.

Fourteen Teachers who joined DAT school system in (2008/2009) and (2009/2010) academic years participated in (2013/2014) academic year survey also. Eight teachers confirmed that there were professional development training before (2013/2014) academic year start and eleven teachers had training workshops during same academic year, which demonstrated in Figure 4.6. That means DAT School management ensured to focus on how deliver the one-to-one laptop technology in accurate way, which implemented through preparing teachers before they handed over the laptop. The

teachers' preparation took place before the school academic year start through workshops and specific training in the way they should use the laptop in teaching inside the classroom. Moreover, to support them during the academic year by setting up a program continuation training plans for many reasons: 1. to guarantee the correct use of the laptop in the classroom, 2. to eliminate any issue appears related to the use of new technology and how to contain it and 3. to increase teachers' technology experience whenever new software or applications engaged in teaching curriculum during the year.
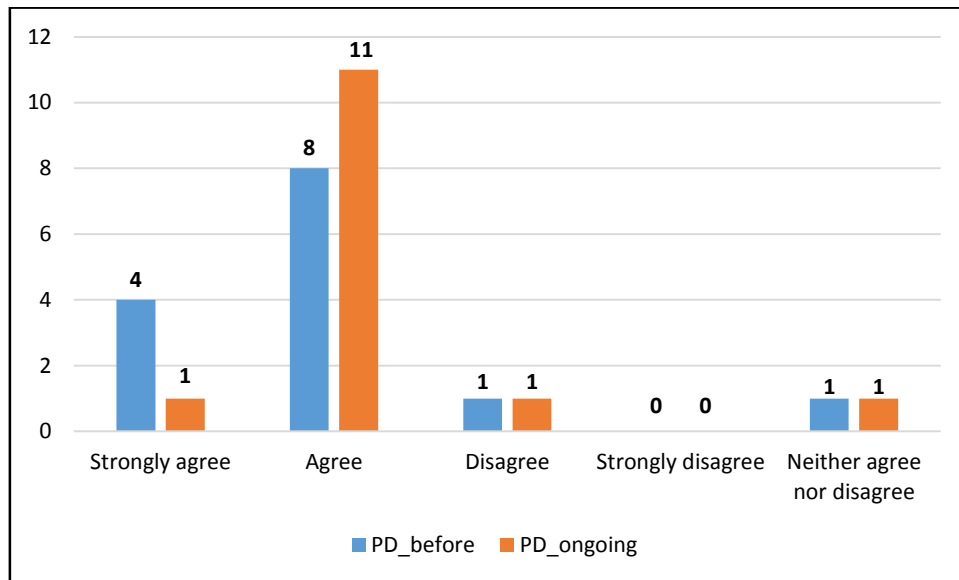
Figure 4.6 PD-before & Ongoing (2013/2014) Academic years.

4.1.2.2. Effect of Teachers' Professional Development on students classroom activities.

The existence of professional development in such technology deployment have huge impact on teachers' preparation level, which illustrated in Table 4.2 from teachers survey conducted in (2009/2010). It is obvious that the lack of professional development affect negatively on teachers' preparation level in facilitating, helping or even supporting students' activities in classrooms. Otherwise, in academic year (2013/2014) the results in Table 4.3 showed that teachers were prepared to support students in different classroom activities areas such as use-varied recourses, encourage students to collaborate with each other in groups and help students to plan, review and to share their work through using new technology tool.

Preparation level / Classroom Activities	Not at all prepared	Moderately prepared	Prepared	Well Prepared	Very well Prepared
Facilitate students to use new technology tool.	56.67%	11.67%	13.33%	13.33%	5%
Support students to use varied resources.	58.33%	8.33%	16.67%	13.33%	3.33%
Help students to follow the process of planning, doing, reviewing and sharing their work.	56.67%	8.33%	16.67%	16.67%	1.67%
Support students in creating original work products that reflect their own unique ideas	56.67%	10%	20%	10%	3.33%
Help students ensure that all members are active participants' in-group activities (eg. Projects work, presentations).	55%	8.33%	13.33%	16.67%	6.67%
Support students in asking one another questions and helping other as they work on their project.	55%	8.33%	15%	8.33%	13.33%

Table 4.2: level of Teachers' Preparation (2009/2010)

Preparation level / Classroom Activities	Not at all prepared	Moderately prepared	Prepared	Well Prepared	Very well Prepared
Facilitate students to use new technology tool.	6.82%	29.55%	47.74%	13.64%	2.27%
Support students to use varied resources.	6.82%	13.64%	52.27%	25%	2.27%
Help students to follow the process of planning, doing, reviewing and sharing their work.	9.1%	15.91%	45.45%	25%	4.55%
Support students in creating original work products that reflect their own unique ideas	2.27%	25%	38.64%	27.27%	6.82%
Help students ensure that all members are active participants' in-group activities (eg. Projects work, presentations).	2.27%	18.18%	45.45%	29.55%	4.55%
Support students in asking one another questions and helping other as they work on their project.	2.27%	6.82%	50%	34.1%	6.82%

Table 4.3: level of Teachers' Preparation (2013/2014)

4.1.3. <u>Students' outcome from teachers' perspective.</u>

The two-research surveys examined the improvement level of students' outcome and teachers' technology knowledge influence on using one-to-one laptop initiative in the classroom. It examined four basic student-learning skills: (writing, research, presentation and solving problem) and students' ability to work with each other.

Results collected from (2009/2010) survey proved that lack of teachers' technology knowledge affect negatively on student skills. Teachers stated that there were no influence on students learning performance. Responses percentages declared no impact on leaning skills detailed as follow: (73.33%) writing skills, (58.33%) research skills, (65%) presentation skills, (68%) Problem solving and (66.67%) on students ability to work together Figure 4.7.
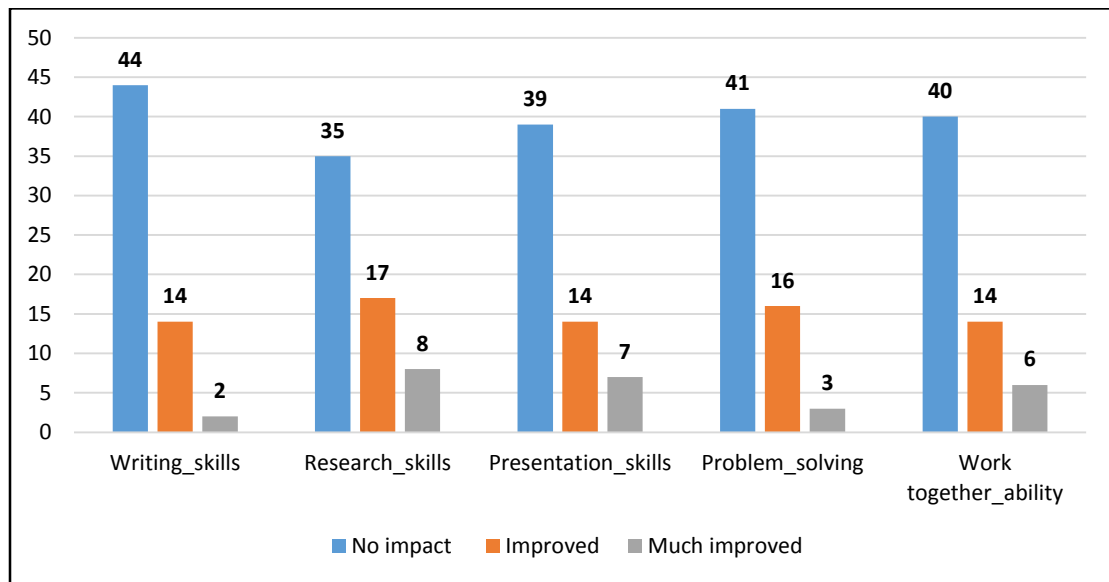

Figure 4.7: Students Improvement Level (2009/2010)

Contrary, (2013/2014) survey stated better responses. Teachers delivered their technology knowledge in the classroom which effect and influence positively on students. In general, survey results showed improvement in students learning basic skills, which Figure 4.8 illustrated, number of teachers who proved that for each skill.
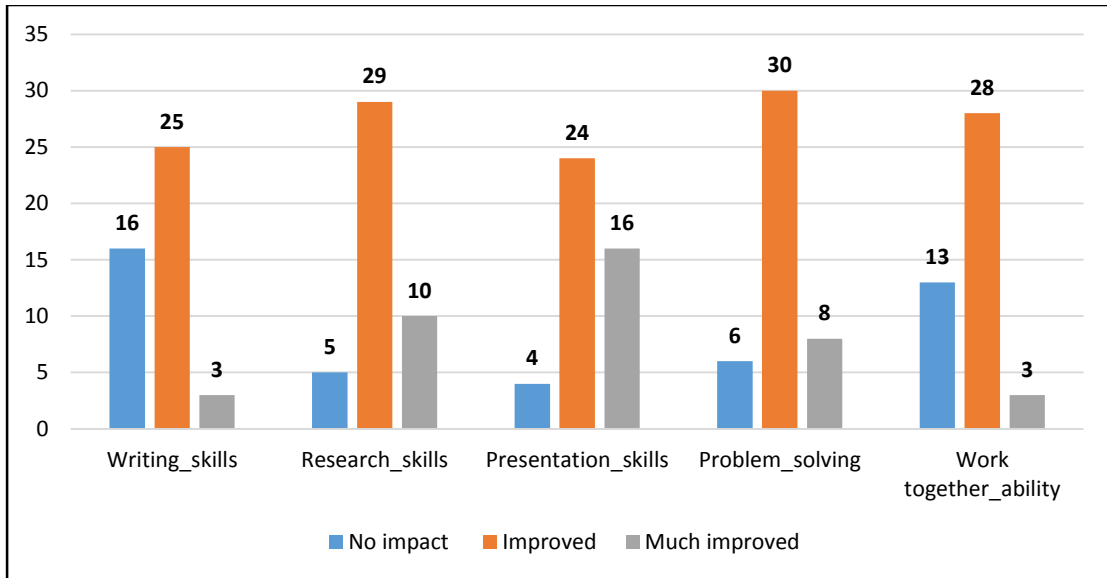
Figure 4.8: Students Improvement Level (2013/2014)

4.1.4. Teachers' opinion towards Technical Support assistance.

4.1.4.1.Technical Support status.

The survey output revealed that DAT School management did not take technical support role in consideration before the one-to-one laptop deployment which proved by teachers' responses. (55%) teachers strongly disagree that they did not get significant technical support assistance during (2009/2010) academic year shown in Figure 4.9, which affect negatively in deployment process. Conversely, DAT school management indicated that technical support must be available before and during to support the deployment. In

(2013/2014) survey responses revealed that (66%) teachers strongly disagreed, they got technical assistance during the academic year shown in Figure 4.10.

Figure 4.9: Technical support (2009/2010)
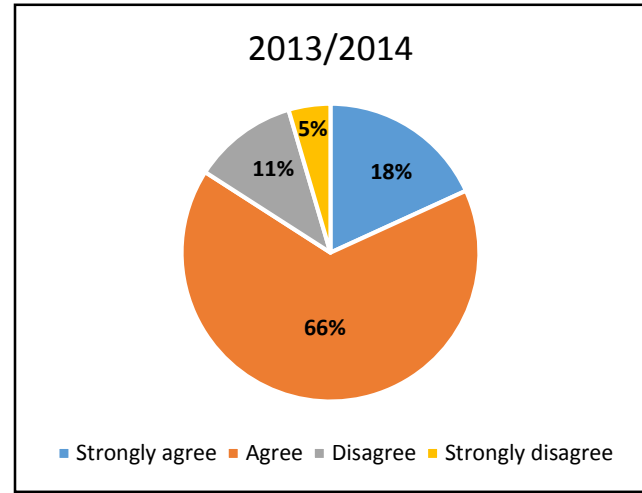
Figure 4.10: Technical support (2013/2014)

4.1.4.2. School Technical Support and infrastructure (2013/2014).

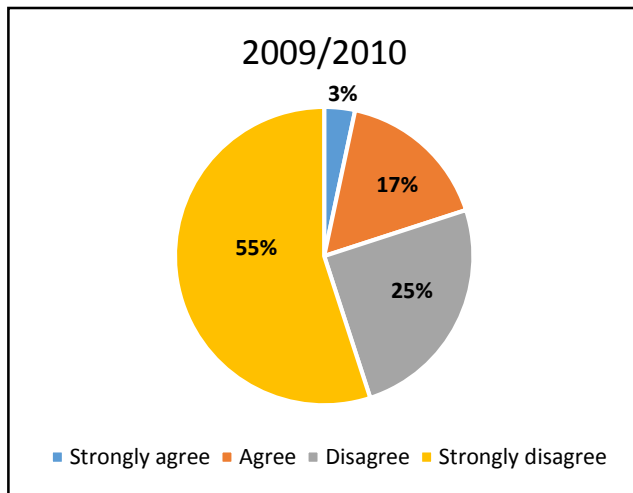After the negative responses conducted in (2009/2010) towards technical support DAT management attempted to enhance the school technical support assistant and infrastructure. Three aspects that DAT management relied on to appeal the importance of technical support team in the deployment of one-to-one laptop initiative:

1. School infrastructure continuous improvement.
2. Technical support team availability in school.
3. Collaboration between technical support team and teachers.

Results collected from (2013/2014) Survey confirmed that the three mentioned aspects above are very significant for teachers to support them during the deployment. Figure 4.11 showed 25 teachers (56.82%) proved that there were adequate continuous improvement of school local network, internet and wireless services that fall under infrastructure term, 31 teachers (70.45%) strongly agreed on having technical support team available in the school is very essential. In addition, to simulate one-to-one laptop initiative technology and studying materials DAT School assign a teacher as E-learning coordinator to collaborate with technical support team, which helps in transferring

teachers (hardware and software) needs. The survey asked teachers about the importance of that collaboration, positive responses presented as follow: 23 teachers strongly agreed and 20 teachers agreed that it is important to have such collaboration.
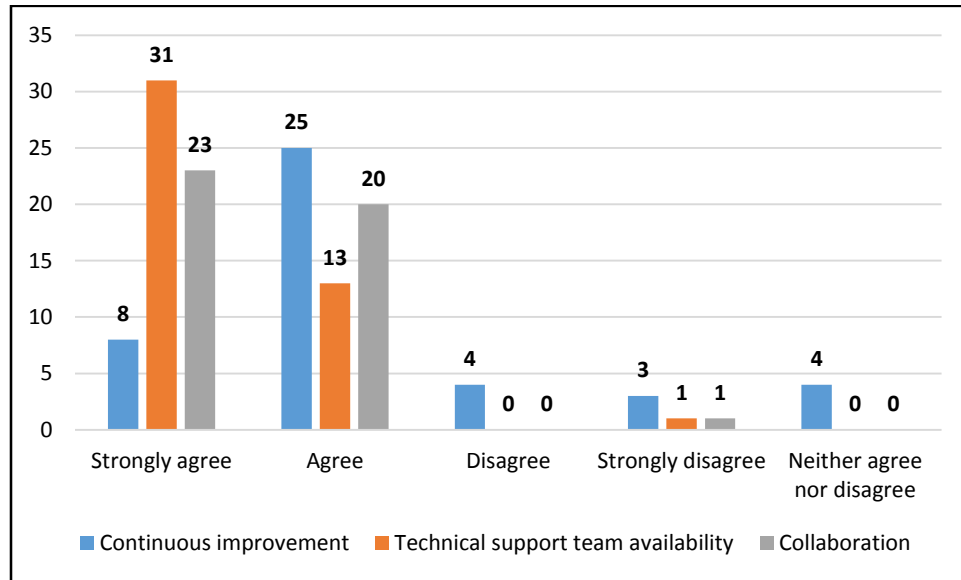
Figure 4.11: Technical support aspects (2013/2014)

4.2. Analyzing Students' Survey

4.2.1. Demographic data

A total of 124 students responded to the online survey, participated students were from G10, 11 and 12. The survey conducted at the end (2013/2014) academic year as shown in Table 4.4 below.

Grade	No. Responses	No. Students
G10	41	142
G11	23	190
G12	60	177

Table 4.4: number of students' responses.

The students' survey were shaped to aid answering the research questions, to make it significant from students prescriptive it's important to major students acceptance of using laptop in the school. For that, a survey question asked them about how often they are using laptop in the school. (57.26%) of Students are always using the laptop in the school

36 of them were from grade 12, 21 students from grade 10 and 14 students from grade 11 as illustrated in Figure 4.12. That is conclude students are willing to accept one-to-one laptop initiative, as they needed to help them in the school through school years.
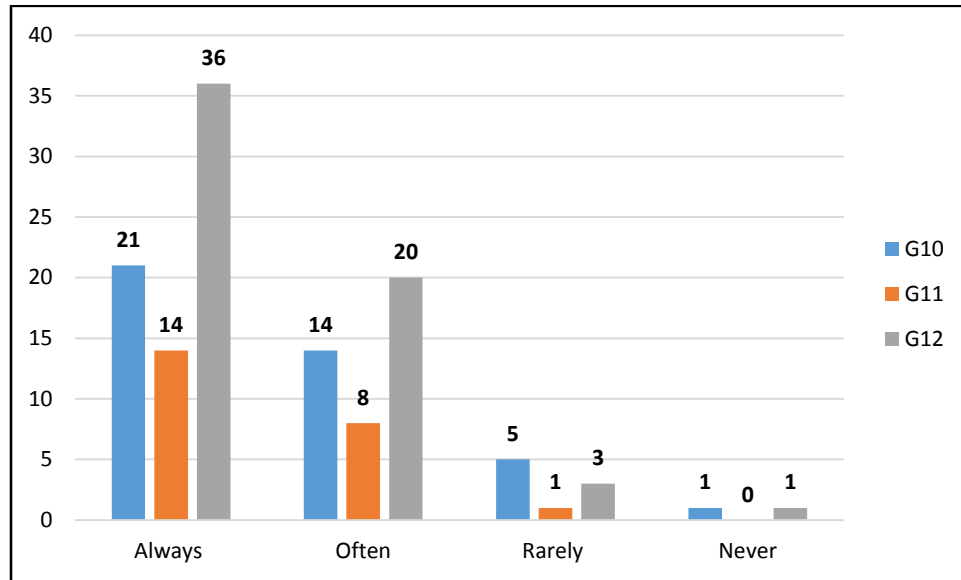
Figure 4.12: Students Laptop usage.

4.2.2. Teachers' technology knowledge from students' prescriptive

Students were asked about teachers' knowledge using the one-to-one laptop technology in the classroom. (54%) students agreed that teachers have good technology knowledge to support them during the class. Students' responses in Figure 4.13 proved that professional development training workshops affect positively on how teachers implement this knowledge in class, which approve the previous section of teachers' preparation level.
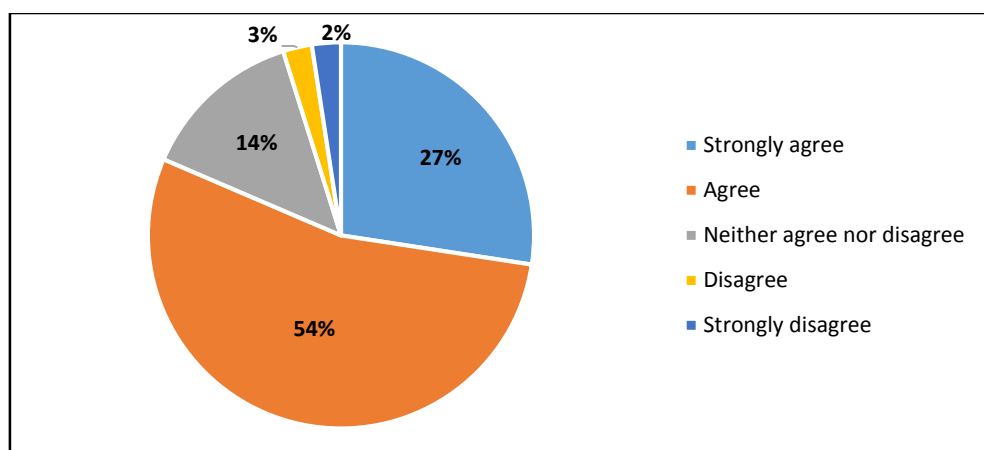
Figure 4.13: Teachers Tech. Knowledge from students prescriptive

4.2.3. Students' opinion towards school technical support

Students in other hand have different responses regarding school technical support team, only (36%) students agreed on having technical support team is important to fix their laptop technical issues. In addition, (30%) students strongly disagree there were no improvement in the school infrastructure as shown in Table 4.5.

An investigation conducted to disclose the survey results. It found that students have technical experience especially in fixing their own software laptop problems. When it comes to hardware issues, they needed technical support team to fix it. Moreover, for the school network improvement, students were misusing the school network, they were consuming the network through playing games, watching movies and downloading big size files through school internet, which not related to education or learning purpose

	Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
Technical support team availability.	12%	36%	24%	11%	17%
School network stability.	6%	26%	15%	23%	30%

Table 4.5: Students Technical support opinion

4.2.4. Other findings: Students' perception on using one-to-one laptop

The survey examined student acceptance of using the new one-to-one technology in their classroom as follow.

4.2.4.1. Using laptop in class increased my class participation.

Students showed positive altitude in adopting laptop in their learning practice, which is a positive evidence for the below students 'passing percentages section. 18 students (30%) form grade 12, 9 (39%) from grade 11 and 13 (32%) from grade 10 agreed that using laptop as learning tool increases their participation in the classroom shown in Figures 4.14, 4.15 and 4.16.
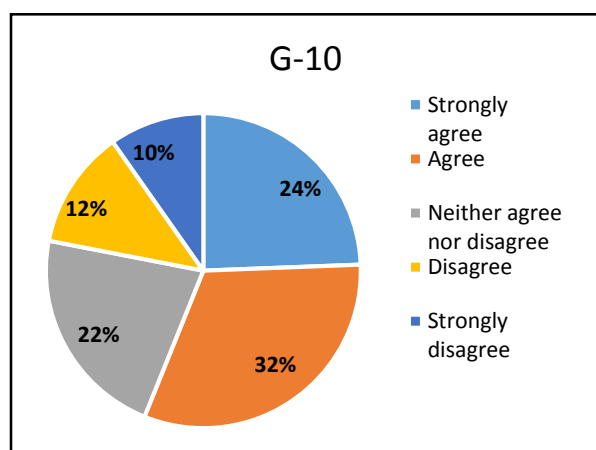
Figure 4.14: Grade-10 Participation
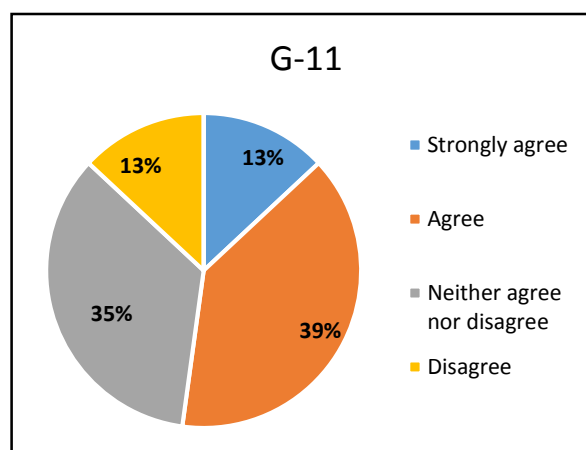
Figure 4.15: Grade-11 Participation
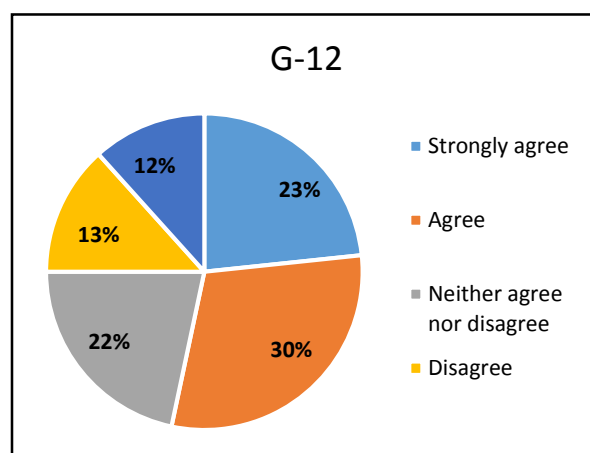
Figure 4.16: Grade-12 Participation

4.2.4.2. Using laptop in class makes learning process easier

It is obvious from survey results in Figures 4.17 , 4.18 and 4.19 that utilizing laptop device in classroom make learning process easier for students which confirmed by (40%) 24 students in grade 12, (48%) 11 students in grade 11 and (41%) 17 students in grade 10 strongly agreed on that.
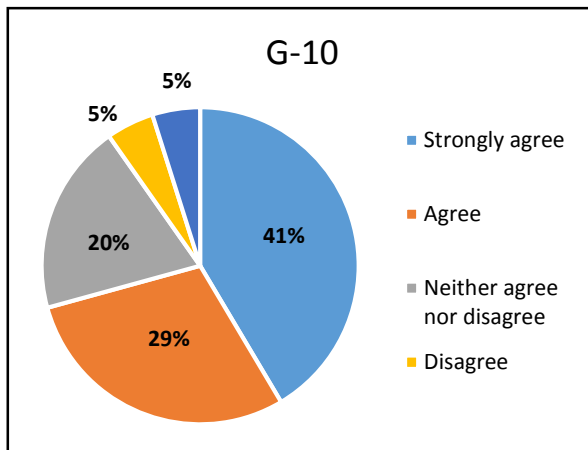
Figure 4.17: Grade-10 Learning Process
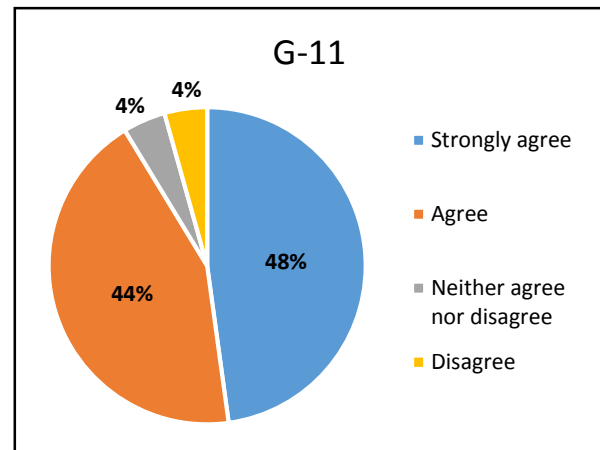
Figure 4.18: Grade-11 Learning Process
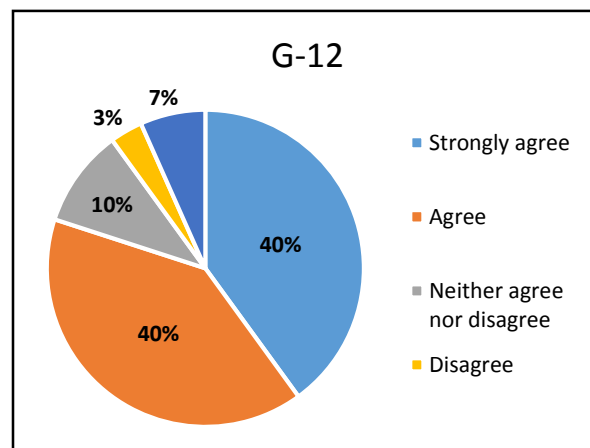
Figure 4.19: Grade-12 Learning Process

4.3. Findings from Students passing percentage

For the purpose of this research study, it is significant to study students' passing percentages before and during one-to-one laptop deployment to explore the deployment influence on students' achievements. The reason behind collecting such data is students Key Performance Indictor (KPI) of DAT School. The factors of students KPI are:

1. Student Marks.
2. Class attendance.
3. Technology knowledge.
4. Subject knowledge.
5. Social interaction.

Each KPI factor mentioned has an effect on other factor. Precisely, technology knowledge will affect student marks and social interaction, because of that it is important for student to have good technology knowledge, which presented by technology marks achievement and how it can be used in school to serve their learning process.

Table 4.6 below illustrates passing percentage for grades (10, 11 and 12) collected from DAT School Assessment Department from (2007/2008) until (2013/2014) academic years. Before the deployment, students passing percentages were stable for all grades that fall in (2007/2008) and (2008/2009). In the year of one-to-one deployment (2009/2010) students passing percentage increased by (88%) for grade 10 and 11 and (95%) for grade12 which is evidence that students have technology background and their ability to adapt this new technology tool in the school. The passing increment continued also for academic year (2011/2012).

Unexpectedly, a drop happened in (2012/2013) for all grades, especially grade 10 (86%). To disclose the reason behind grade 10 sharp drop an investigation conducted through interviewing students and DAT school curriculum ICT department. On that academic year DAT School management, implemented new school system called PLATO and it was compulsory for all students to use when they are in the school. The system is a knowledge source base for teachers and students. DAT School curriculum uploaded all

books, studying materials and projects in PLATO system. Some interviewed teachers stated, "*PLATO implementation wasted our teaching time in order to train ourselves and students to use the system rather than teaching normal class*", "*It was crucial on us and students not to be informed and prepared in the begging of academic year that new system will be integrated in classroom teaching*" and "*We know that PLATO integration is for the benefit of teachers and students but the poor implementation plan and the wrong time caused us difficulties and challenged us to keep the class performance high which unfortunately affect badly on student marks*".

New grade 10 joiner faced difficulties to adapt the system in their first year in school with the absence of books and martials paper, which reflect their low technology knowledge level they have using such system. Additionally, grade 11 and 12 students faced slight difficulties to transfer from laptop traditional use to be a main systematic tool of learning on that year. Furthermore, Table 4.7 showed only three responses got form teacher survey disclosed that teacher in (2012/2013) did not get the expected benefit as the year before (2011/2012) 11 teachers responded because of PLATO implementation.

Therefore, DAT School management arranged a two weeks workshop ahead of each academic year start preparing and training new grade 10 joiners to be more familiar with PLATO system. The workshop effects were positive on new joiners of (2013/2014) passing percentage (99%). Additionally, 43% of teachers from (2013/2014) survey confirmed that they gained the maximum benefit from one-to-one laptop deployment in your classroom in (2013/2014).

Marks/Years	2007/2008	2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014
G10	77%	77%	88%	93%	96%	86%	99%
G11	73%	72%	88%	93%	96%	92%	98%
G12	80%	84%	95%	97%	99%	97%	99%

Table 4.6: Students Passing Percentage/Year

Academic year	No. Responses of Teachers
2009/2010	4
2010/2011	7
2011/2012	11
2012/2013	3
2013/2014	10

Table 4.7: Teachers Responses/Max benefit of 1:1

4.4. Answer research questions

From above findings, the below two research questions can be answered:

Research Question 1: *What are the effects of professional development and technical support in deploying one-to-one laptop initiative?*

Professional development effects:

As it is clear from the comparison that made between teachers' survey in (2009/2010) and (2013/2014) on professional development, findings showed the huge effects on teachers deploying one-to-one initiative in classroom:

1. Professional development absences affect negatively on the success of one-to-one laptop deployment.
2. Professional development effects teachers' acceptance to use the one-to-one initiative in the classroom as main teaching tools.
3. Teachers' preparation level affected absolutely by the amount of trainings provided before and during the academic year.
4. Teachers' preparation level affect students' classroom activities using one-to-one laptop.
5. Implementing new application using one-to-one laptop with no proper training for teachers and students affect badly on gaining the benefit of using such technology.

Technical support effects:

According to teachers' survey (2009/2010) and (2013/2014) and students' survey (2013/2014), technical support availability affects the one-to-one laptop deployment as follow:

1. In (2009/2010) teachers disagree on having any type of in-house technical support, which give them difficulties in deploying one-to-one initiative fully in the classroom.

2. Poor school infrastructure forced teachers and students to use laptop in traditional way without any other online recourses like internet or school internal network resources.

3. In-house technical support team affects positively to control the misuse of students online (internet and internal network) access. Also, fixing any technical hardware issues occur in laptops.

4. Collaboration among technical support team and teachers is important to deliver the main objective of using one-to-one technology in the classroom.

Research Question 2: *Does the teachers' knowledge of technology affects students' performance and outcome?*

Lack of teachers' technology knowledge affects negatively on students' performance and outcome, which discovered from teachers survey results conducted in (2009/2010). Students' class performance was majored according to the four basic skills mentioned earlier in teachers' surveys. In (2013/2014) teachers' survey better results collected proving that professional development trainings reflect passively on teachers' preparation level and technology knowledge experience. Students' survey (2013/2014) prove that teachers were having good technology knowledge that supported them in classroom activities, moreover reflect positively in there passing percentage.

CHAPTER 5: Discussion

This chapter designed to discuss the research implications of each findings, recommendations offered for improvements, ideas for future studies and conclusion. Due to the availability and emergence need of using laptop as leaning devices around the world. Obviously, there is a need for studying and investigating the new learning environment created by such technology deployment in the school to find ubiquitous solutions. This study exposed many important insights from qualitative and quantitative data collection.

The main aim of this study is to investigate three main factors that affect deployment of on-to-one laptop initiative in high schools, which are professional development, technical support and teachers' technology knowledge. The study focused on teachers and students, who formed the sample, in order to have data related to their experience from the first year of the deployment and after four years.

5.1. Implications

5.1.1. Importance of professional development.

Findings found that teachers asked to integrate one-to-one laptop in their classroom activities have genuine issues. Many of these issues come from teachers' first time using the new technology and its role in teaching. It is important consideration from school management to plan professional development before deployment any new technology in classroom. Arrangement of Professional development should be planned if any new technology adoption is going to be sustained (Donovan, Hartley & Strudler, 2007). Effective professional development should prepare and provide teachers with essential capability to use the one-to-one laptop in the classroom.

One of the critical concern that school management was not to have the ability to take full advantage of one-to-one laptop technology in teaching and learning after (2009/2010)

deployment results. Therefore, there was ongoing training and development to increase teachers' preparation level during the academic year.

Training workshops focus to provide teachers with help and skills to integrate and use the technology themselves in their instruction (Penuel, 2006). At the end of academic year (2013-2014) survey, students clarified that teachers' were having good technology knowledge to use it within the classroom. This clarification come from teachers' ability to utilize technology experienced and skills gained from the adequate training they got.

5.1.2. Importance of technical support.

Based on the results, with the absences of technical support assistance, it is difficult to achieve the maximum benefit of the one-to-one laptop initiative. Technical support is important to iron out any technical issues to keep one-to-one laptop initiative running efficiently. Moreover, students misuse of school network can causes pressure on school network, which have negative impact on school internet and internal network speed. This behavior need to be controlled by technical support team to eliminate and control any misuse happened. Penuel (2006) agreed that just as professional development is critical to support one-to-one initiative, technical support critically needed also to support one-to-one or any other technology initiatives.

5.1.3. Students' performance and outcome.

The study revealed so clearly that, several reasons affect students' performance and outcome, these reasons can be drown from the way of teachers use the new technology to teach the students and how teachers are helping students to increase their leaning skills using one-to-one laptop in the classroom. Clearly, students' positive attitude to adapt such technology increase their passing marks during the academic year. However, implementing any new system through one-to-one laptop can affect badly in teachers and students.

5.2. Conclusion

In conclusion, this study focused on challenges and importance of professional development and technical support assistance presence in one-to-one laptop initiative.

The case study reflects teachers' preparation level through professional development availability before and during the academic year deployment. How professional development improves teachers' technology skills, which effect on students' class performance and marks outcome. In addition, DAT school management needs to give significant attention to technical support assistance in terms of technical issue support, school network and infrastructure improvements to fulfill the requirement needed and to prepare policies and procedures for using the school networks when deploying one of the latest education technology.

5.3. Recommendations

According to the analyses chapter conducted earlier, some recommendations could be addressed in order to assist educators and school decision maker when deployment of one-to-one laptop occurred in the future. The following recommendation divide in to the two main challenges that DAT School faced: (1) professional development before during and after deployment and (2) Technical support status. In order to give clear and appropriate feedback recommendations.

5.3.1. Teacher professional development

Based on the findings from two teachers' surveys conducted in (2009/2010) and (2013/2014) academic years. Professional development presence is important to ensure the success of one-to one laptop initiative deployment. Lack of professional development has huge effects on the level of teachers' preparation to deliver the maximum benefit of the new technology and the students' outcome in the classroom. Therefore, researcher highlight recommendations related to professional development as following:

1. Prepare a sufficient plan strategy and timetable for professional development before deploy any new technology.
2. Professional development need to be designed a according to the education needs.
3. Ensure all teachers to participate in training workshops as teaching requirement.
4. Provide teachers with software application that can control and monitor students laptop activities in the classroom.

5. Involve curriculum department to integrate one-to-one laptop technology into school curriculum.

6. Curriculum department needs to study the impact of the new technology tools conducted on teachers and students to provide future improvements.

7. School management is recommend to evaluate teachers' performance skills using one-to-one laptop as teaching tools.

8. School management should be sure that deploying one-to-one laptop have positive impact on students' learning and achievements.

9. Students need to be educated against using school laptop and network for non-educational activities.

10. Train students if any new technology system implemented in the school as requirement of learning.

11. Students should be aware about the Do's and Don'ts before talking charge of the laptop.

12. Students and their parents must be fully aware about the importance of terms mentioned in the agreement document.

5.3.2. Technical support status

Similarly, technical support should be available to ensure the success of one-to-one initiative in terms of supporting, fixing and controlling any technical issues (Hardware/Software) that occur. According to teachers' survey (2013/2014) and students' survey, the absence of technical support team and the poor school infrastructure affect severely on the one-to-one laptop deployment. For that below recommendations that can help to give clear insight on technical support for any new technology initiative:

1. School management should ensure to have in house technical support team.

2. Technical support team need to be fully aware about any new technology that school is conducting.

3. Technical team should prepare a policies and agreements of using laptop and school network for teachers and students.

4. School internet and internal network usage need to be monitored all the time to eliminate any non-educational use.

5. Restrict students to use the school network for any non-educational purpose such as videos and games.

6. Always maintain and improve school infrastructure to keep one-to-one laptop work in perfection.

7. Technical support team needs to collaborate with E-learning coordinator teacher to transfer all the technical knowledge and update to other teachers.

8. Prepare laptop image that include curriculum standards software suites which help teachers spending their time teaching content not software applications.

5.4. Suggestion for Further Studies

Additional studies are needed to declare one-to-one laptop impact on students' score achievements for each subject they study. In addition, more studies should be implemented on school proper infrastructure specification that can adapt such new technology in school environment. Moreover, the type of training workshops aligned with curriculum department instructions and observation for teachers in terms of professional development should be considered as a factor.

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Appendix A

Marks/Years	2007/2008	2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014
G10							
G11							
G12							

Appendix B

Teachers' Online Survey\DAT Curriculum Department

Dear Teachers,

The DAT Curriculum Unit is evaluating the effect of the 1:1 laptop Solution in your classroom and school.

You are an integral part of this evaluation! Please share candid feedback about your general impressions and current experience of this solution and the use of technology in your classroom. This survey will take approximately 5 minutes to complete.

Please note that all the data we collect will be kept completely confidential.

A. Teacher characteristics

1. What grades you are teaching?
   - G10
   - G11
   - G12
2. What is your age?
   - 20-29
   - 30-39
   - 40-49
   - 50+
3. What is your gender?
   - Male
   - Female
4. Years of teaching experience _____

B. Teacher Professional Development

1. There was adequate professional development before I started using the 1:1 e-learning solution in my classroom.
   - Strongly disagree
   - Disagree
   - Agree
   - Strongly agree

2. There has been adequate ongoing professional development throughout the school year.
   - Strongly disagree
   - Disagree
   - Agree
   - Strongly agree

3. There has been sufficient time to discuss strategies for effective uses of MacBooks/computers with colleagues.
   - Strongly disagree
   - Disagree
   - Agree
   - Strongly agree

4. After having a chance to implement what you learned, in the Intel training, in your classrooms, how well prepared were you to do the following?

Technology Skills

4.1. Facilitate students' open exploration of new technology tools.
   - Not at all prepared
   - Moderately prepared
   - Prepared
   - Well prepared
   - Very well prepared

4.2. Support students' use of varied resources (e.g., peers, Help Guide) to learn new skills.
   - Not at all prepared
   - Moderately prepared
   - Prepared
   - Well prepared
   - Very well prepared

Critical Thinking

4.3. Help students follow the process of planning, doing, reviewing, and sharing their work.
   - Not at all prepared
   - Moderately prepared
   - Prepared
   - Well prepared
   - Very well prepared

4.4. Support students in creating original work products that reflect their own unique ideas.
   - Not at all prepared
   - Moderately prepared
   - Prepared
   - Well prepared
   - Very well prepared

Collaboration
4.5. Help students ensure that all members are active participants in group activities (e.g., project work, presentations).
   - Not at all prepared
   - Moderately prepared
   - Prepared

- Well prepared
- Very well prepared

4.6. Support students in asking one another questions and helping one another as they work on their product.
- Not at all prepared
- Moderately prepared
- Prepared
- Well prepared
- Very well prepared

C. Technical Support/ infrastructure

1. There has been adequate ongoing technical support since the 1:1 e-learning Solution was introduced.
   - Strongly disagree
   - Disagree
   - Agree
   - Strongly agree

D. Student's outcomes

1. To what degree do you think the 1:1 e-learning solution has influenced your students' performance?

1.1. Writing skills
- No impact
- Improved
- Much improved

1.2. Research skills
- No impact
- Improved
- Much improved

1.3. Presentation skills
- No impact
- Improved
- Much improved

1.4. Ability to work with other students
- No impact
- Improved
- Much improved

1.5. Problem solving skills
- No impact
- Improved
- Much improved

Appendix C

Teachers' Online Survey

A. Teacher characteristics

1. What is your gender?
   - Male
   - Female
2. What is your age?
   - 20-29
   - 30-39
   - 40-49
   - 50+
3. What grades you are teaching?
   - G10
   - G11
   - G12
4. When did you start working in DAT-High school/academic year?
   - 2008/2009
   - 2009/2010
   - 2010/2011
   - 2011/2012
   - 2012/2013
   - 2013/2014
5. Years of teaching experience _____

B. Teacher Professional Development

1. There was adequate professional development before I started using the 1:1 e-learning solution in my classroom.
   - Strongly disagree
   - Disagree
   - Agree
   - Strongly agree

2. There has been adequate ongoing professional development throughout the school year.
   - Strongly disagree
   - Disagree
   - Agree
   - Strongly agree

3. There has been sufficient time to discuss strategies for effective uses of MacBooks/computers with colleagues.
   - Strongly disagree

- Disagree
- Agree
- Strongly agree

4. After having a chance to implement what you learned, in the Intel training, in your classrooms, how well prepared were you to do the following?

Technology Skills

4.1. Facilitate students' open exploration of new technology tools.
- Not at all prepared
- Moderately prepared
- Prepared
- Well prepared
- Very well prepared

4.2. Support students' use of varied resources (e.g., peers, Help Guide) to learn new skills.
Not at all prepared
- Moderately prepared
- Prepared
- Well prepared
- Very well prepared

Critical Thinking

4.3. Help students follow the process of planning, doing, reviewing, and sharing their work.
- Not at all prepared
- Moderately prepared
- Prepared
- Well prepared
- Very well prepared

4.4. Support students in creating original work products that reflect their own unique ideas.
- Not at all prepared
- Moderately prepared
- Prepared
- Well prepared
- Very well prepared

Collaboration

4.5. Help students ensure that all members are active participants in group activities (e.g., project work, presentations).
- Not at all prepared
- Moderately prepared
- Prepared
- Well prepared
- Very well prepared

4.6. Support students in asking one another questions and helping one another as they work on their product.
- Not at all prepared
- Moderately prepared
- Prepared
- Well prepared
- Very well prepared

C. Technical Support/ infrastructure

1. There has been adequate ongoing technical support since the 1:1 e-learning Solution was introduced.
   - Strongly disagree
   - Disagree
   - Agree
   - Strongly agree

2. There has been continuous improvement in school infrastructure (e.g. Local network, internet service and wireless service) since the 1:1 e-learning Solution was introduced.
   - Strongly disagree
   - Disagree
   - Agree
   - Strongly agree

3. Technical support staff availability is essential in school.
   - Strongly disagree
   - Disagree
   - Agree
   - Strongly agree

4. Collaboration between Technical support team and faculty team is important.
   - Strongly disagree
   - Disagree
   - Agree
   - Strongly agree

D. Student's outcomes

1. To what degree do you think the 1:1 e-learning solution has influenced your students' performance?

1.1. Writing skills
- No impact
- Improved
- Much improved

1.2. Research skills
- No impact
- Improved

- Much improved

1.3. Presentation skills
- No impact
- Improved
- Much improved

1.4. Ability to work with other students
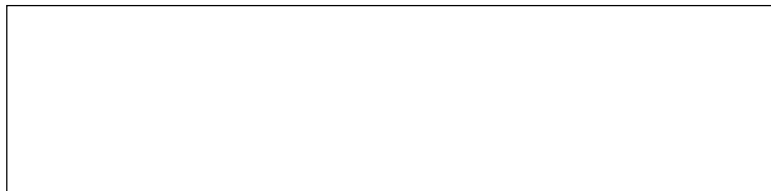- No impact
- Improved
- Much improved

1.5. Problem solving skills
- No impact
- Improved
- Much improved

E. In your opinion, when you felt that you are gaining the maximum benefit from one-to-one laptop deployment in your classroom.
- 2009/2010
- 2010/2011
- 2011/2012
- 2012/2013
- 2013/2014

F. Can you mention the challenges that you faced in one-to-one laptop deployment in your classroom, did they get better?

Appendix D

Student's Online Survey

1. In which Grade you are:
   - G10
   - G11
   - G12
2. How often you are using your laptop at school?
   - Always
   - Often
   - Rarely
   - Never
3. Teachers know how to use laptop during class.
   - Strongly disagree
   - Disagree
   - Agree
   - Strongly agree

4. Using laptop in class increased my class participation.
   - Strongly disagree
   - Disagree
   - Agree
   - Strongly agree

5. Using laptop in class makes learning process easier.
   - Strongly disagree
   - Disagree
   - Agree
   - Strongly agree

6. Technical support team availability help to fix laptop technical issues.
   - Strongly disagree
   - Disagree
   - Agree
   - Strongly agree

7. In your opinion, School network (e.g. Local network, Internet service & wireless service) become more stable during the academic year/s.
   - Strongly disagree
   - Disagree
   - Agree
   - Strongly agree