

# Integration of Mobile Devices into Ubiquitous Learning by the 21<sup>st</sup> Century Teenagers

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**Abstract** Mobile devices become ubiquitous, affordable and accessible for the 21<sup>st</sup> century teenagers, as such they have the chance to perform the learning activities through using mobile devices without the constraint of time and space. Many quantitative studies have been done for investigating the perception of technology use in education, but the studies done do not specifically focus on the use of mobile devices into ubiquitous learning by the teenager especially in Malaysia. Therefore, this research conducted to obtain an in-depth understanding of the usage pattern of these teenagers on their mobile devices and to clarify to what extent they used the mobile devices in performing learning activities. The study also analyses the factors affecting the teenagers from using mobile devices to perform learning and provides a snapshot of the way the teenagers perceive the use of mobile devices qualitatively. The study shows that teenagers possessed positive attitudes towards using mobile devices into performing ubiquitous learning as they see the mobile devices as convenient, fast response and easy to access to knowledge of information. However, using mobile devices to perform ubiquitous learning is much depends on the individual's preference, interest and self-motivation. Learning facts, languages and skills using mobile devices are the most preferable activities among the teenagers.

**Keywords** Mobile devices, Teenagers, Ubiquitous learning

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## 1. Introduction

With the development of Information and Communication Technology (ICT), everyone has the opportunity to explore in a world that is full of information by using technology devices. The application of Information and Communication Technology (ICT) is not only emphasized in cooperative business and the industrial sector, but it is also an essential part of education at different levels[1]. In both educational institutions and homes, information and communication technologies (ICT) are widely seen as enhancing learning[2].

According to reports on global ICT trends in the year 2012, 92% of the world's population now has a mobile phone[3] and 78% of the teenagers from age 12 to 17 own a cell phone and almost 50% of them indicate that their phone is a smartphone[4]. The ubiquitous availability of these portable devices has changed the learning methods and learning strategies of today's teenagers. In the *MNC Horizon Report 2012*, there is a research indicates that the tablets are the foster key to 21st century skills in education which includes creativity, innovation, communication, and collaboration in students due to the design of the device that make the user easily to share their screens[5]. This has shown that the

teenagers in this mobile-technology era can perform ubiquitous learning easily. They can simply gain access to the information and content from different resources in the web. Furthermore, the teenagers have more variety of choices to obtain knowledge and information. Hence, this study will analyze the usage pattern of teenagers and also to provide a snapshot of mobile and ubiquitous learning in the 21<sup>st</sup> century.

### 1.1. Problem Statement

Various studies have investigated student's readiness, attitude and perceptions towards mobile learning by a quantitative method[6] or examining the challenges and opportunities of mobile devices supporting teaching and learning in a designed learning context[7],[8]. Most of these researches mainly focus on the study of formal learning. However, qualitative research on identifying teenagers' perception on using mobile devices as educational tools for ubiquitous learning is yet to be conducted. Thus, the research is carried out to investigate teenagers' preference and perception of using mobile devices in ubiquitous learning. As the trends go by, the technology has been emerged on the students. Most of the students today are known as digital natives and the research is ought to be carry to listen to the students especially the teenagers in school who is so close with the technology daily. With the ubiquitous availability of these portable devices, to what extent the teenagers are using these devices to perform their learning is still unknown. Thus,

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this study creates a better understanding of identifying the influencing factors of integrating mobile devices as learning tools by the teenagers.

### 1.2. Research Objectives

The purpose of this study is to explore teenagers' perceptions of learning and engagement that occurs as a result of using mobile devices in ubiquitous learning. The specific objectives are stated as follows:

1. To figure out the level of usage of mobile devices by teenagers
2. To observe and track the usage pattern of teenagers using mobile devices
3. To identify the influence factors towards the teenagers' attitude and perception of using mobile devices in ubiquitous learning
4. To identify methods of acquiring knowledge of information by using mobile devices
5. To explore the experience of teenager using mobile devices in ubiquitous learning

### 1.3. Research Questions

The specific research questions are stated as follows:

1. How often the mobile devices are used by the teenager?
2. What is the usage pattern of teenagers using mobile devices?
3. What are the stimulating and deterring factors influencing teenagers' attitude and perception in using mobile devices to perform ubiquitous learning?
4. What are the methods used by teenagers in acquiring knowledge of information by using mobile devices?
5. What experiences do teenagers have in using mobile devices in ubiquitous learning?

### 1.4. Limitations of Study

The study has the following limitations that can be remedied in future research:

1. This study is geographically limited to Penang State, Malaysia
2. Response is limited by the participants' willingness to honestly self-report and ability to reliably recall.
3. The results come from a single community and may not be generalized to another community.

## 2. Literature Review

### 2.1. The Trends of E-learning, M-learning and U-learning

The development of the ubiquitous learning (u-learning) is related to e-learning and m-learning. Reference[9] identified that the ubiquitous learning is tightly connected with the general e-learning progress. According to[10], the advancement of computing and communication technologies have promoted the learning paradigms from conventional

learning to electronic learning (e-learning), from electronic learning to mobile learning (m-learning) and now it is evolving to ubiquitous learning (u-learning).

### 2.2. The E-learning

Reference[11] pointed that the term e-learning has come into use in the mid-1990s along with developments in the World Wide Web and interest in asynchronous discussion groups. In late 1990s, e-learning is formally defined as electronically mediated asynchronous and synchronous communication for the purpose of constructing and confirming knowledge. The technological foundation of e-learning is the internet and associated with the communication technologies. With the development of technology, the abundance of resources and relationships made easily accessible via the internet. Wikis, Educational Blog, Virtual World and Podcast are the tools of Web 2.0 providing a platform for the development of e-learning[12].

### 2.3. The M-learning

Reference[13] identified mobile technologies has changed the practice of many people's social life compared to the previous ICTs due to the reason of the previous ICTs were not so intimately connected to the trajectory of a person's social live. This has shown that, the innovation of mobile technologies has made mobile devices become a part of individual's daily life. In the last decade, the ICTs is only used in classroom, however, with this dramatic change in mobile technology, it promotes a new way of learning which mobile learning is. Through the mobility of the devices, learners can perform their learning at any place and anywhere. As similar to the view of[14], a mobile handheld device makes m-learning and e-learning qualitatively different. This can be observed through the nature of these mobile devices, they lead to an expansion of the spaces and times of learning, where the students can perform their learning outside the places of formal education and also the hours of formal timetables.

### 2.4. The U-learning

The evolution of ubiquitous computing has been accelerated by the improvement of wireless technology and the flexibility of the technology[10]. In general, a widely accepted definition of mobile learning is using mobile technologies to facilitate learning while a popular definition of ubiquitous learning is emphasizing on the learning context where learning can happen at anywhere and anytime with the ubiquitous tools[15]. Therefore the u-learning placing less emphasis on mobility and contextual independence, but it is more emphasis on the contextualized and situated learning that mobile devices can provided[14]. In general,[10],[15] had the same view point that u-learning is using mobile devices as the learning tools in accommodating learners' learning style regardless of the constraint of time and space.

### 2.5. Mobile Devices and Ubiquitous Learning

Mobile learning provided good support to micro-learning, a new and effective way of learning[6]. In addition,[17] indicated that mobile devices can be used to deliver digital textbooks and other educational content to students anywhere and anytime, and thus they can effectively contribute to the early growth of ubiquitous learning in education. Reference[18] discovered that the students used mobile technology in school for a variety of reasons. These activities included creating presentations and media, play educational games, and conduct virtual experiments. These activities are more to self-directed and self-paced learning. In addition, according to[19], the workforce demand skills from graduates that are more often acquired from informal learning experiences than in the educational institutions. Thus, it can be observed that, ubiquitous learning has become important in preparing skillful workforce for the future.

### 2.6. The Usage Pattern of Mobile Devices by the Teenagers

Reference[20] highlighted that over the past five years, the ownership of laptop, cell phone and iPod has increased dramatically. Research has shown that the vast majority of young people now carries devices on which they play games, listen to music, and, in many cases, connect to the internet and watch videos[20]. Both *NMC Horizon Report (2012 K-12 Edition)* and[20] have identified that mobile devices has become one of the primary ways that youth interact with and learn from each other and rapidly cemented its place as a media delivery platform for young people. Moreover,[4] also found out that the smartphone adoption among teens has increased substantially and mobile access to the internet is pervasive in the *Teens and Technology 2013 report*. In the case study,[21] summarized that the list of activities of teens go online which included commenting on friends' pictures on social networks, commenting on friends' pages or walls, sending private messages on social networks, going online to obtain news about current events and politics, sending Instant Messages or text messages on social networks, buy things online and sharing content. The finding has shown that cell phone and internet have become ubiquitous in the lives of the teenagers.

### 2.7. The Use of Mobile Devices in Learning by the Teenagers

Smartphones, tablets, and other mobile devices, had become ubiquitous, and are overtaking desktop PCs in popularity, especially with younger users[22]. Reference[14] claimed that a key advantage of smartphones is that many students today already own these devices and carry them with them at all times. Thus,[17] confirmed that the ubiquitous learning is conceptualized as the application of technology in the learning process by students.

As summarized by[7] the key traits of today's learners as being digitally literate, 'always on', mobile, experimental and community oriented. This has shown that the pattern of

learning for the generation of digital native has moved towards into the trends of ubiquitous learning and self-paced learning. These students are of the Net-generation and they are born with the technology, hence, they explore, adapt and use the technologies which emerged in the market[16]. However, to what extent the mobile devices use for ubiquitous learning by the teenagers is still unknown.

Recent research shows the interest in the use of application of mobile learning. According to[23], mobile learning has attracted significant research interest in recent years, the research topics includes the theories underpinning learning design and factors affecting learner experiences and influencing mobile learning adoption including social interaction. Besides, some of the researchers have shown the interest in the acceptance and engagement of students towards mobile learning in higher education[6],[16],[24],[25],[26].

It appears that many researchers focus on mobile learning while some researchers has started to investigate the ubiquitous learning over the past few years but they mainly focus on the ubiquitous learning with the context aware support system in designing an environment[15],[27],[28],[29]. Although there are some research studies shown that the major usage of the mobile devices among teenagers[4], but little research appears to have in-depth of understanding of teenagers' usage pattern and preference towards of mobile devices in learning. In the meanwhile, research has not examined the perception, attitudes and acceptances towards integration of mobile devices into ubiquitous learning by teenagers. Besides, most of these researches employed the quantitative method in acquiring the outcome. With the innovation of technology, ubiquitous learning by mobile devices has become common and learning can happen on every individual but there was still little qualitative research done to identify the determinants for teenagers use and preference of using mobile devices in ubiquitous learning.

## 3. Methodology

The research method was mainly qualitative with supporting by quantitative data. The quantitative method has been used in figuring the level of usage and usage pattern of the teenagers using mobile devices in a certain period of time. The quantitative data is used for supporting the qualitative evaluation for each individual.

The qualitative method is focused on subjective and perceptual aspects of the teenagers' personal background and self-related experience in using mobile devices and integrating them into learning process which this research is mainly focused on. Furthermore, in order to gain the necessary insights into the process of integrating mobile devices into ubiquitous learning, particularly at the interface between the subjective and the background and experience of the teenagers, the qualitative method is selected for the study.

### 3.1. Research Design

The research has been carried out in Penang state, Malaysia. Six teenagers have been invited to take part in the study. They are of different gender from three age groups, which are 13, 15 and 17. Each participant has been engaged in two semi-structured interviews separately. The semi-structured interview will allowed the participants to bring out new ideas during the interview. However, an interview questions which is in accordance with the research objectives and research questions has been prepared in advance as the outline to follow in the interview session. The interviews has been recorded by using an audio recorder with the participants' permission and then transcribed verbatim.

### 3.2. Research Procedure

Two sessions of interview has been carrying out. Six participants have been interviewed by the researcher for between forty minutes to one hour separately in each session. All interviews have been recorded by notes and recorder with the permission of the participants being interviewed. The first session of the interview is to reveal the background of the participants and to figure out the level of usage on mobile devices and their experience towards the use of the mobile devices in performing learning.

After the first interview session, a simple task which required the participant to learn by using their mobile devices has been assigned to the participants. Besides, the daily activities checklist has been given to the participants to fill about their daily activity and time they spend on the mobile devices in a week. Participant daily activities checklist were to track the usage pattern of the participants in a week using mobile devices.

The second interview has been carried out to investigate each of the participants' perception of using mobile devices in performing their learning tasks assigned after a week. The participant has been required to explain the method they use in performing the learning tasks assigned and showed how they understand the process of learning by using mobile devices with an explanation and demonstration. From this session, the study of the deterring and stimulating factors and attitude towards using mobile devices in ubiquitous learning and the methods of acquiring knowledge of information by using mobile devices has been identified. After the interviews, the recordings have been transcribed into the computer files. The data has been interpreted manually.

### 3.3. Instrumentation

A list of 22 interview questions has been prepared. The interview questions have been categorized into two sessions. First session consists of four parts: (1) demographics; to understand the background of the participant by asking the participant fill in the participant background checklist, (2) ownership, accessibility and level of usage, (3) usage pattern, (4) Experience. The second session of the interview consists of two parts: (5) attitudes towards the use of mobile devices in ubiquitous learning and (6) method used.

The participant's background checklist and daily activity checklist were the second instrument to collect the data for the participant background and to figure out the level of usage quantitatively. The instruments have been verified by the experienced lecturer from a higher education institution with at least 8 years of teaching experiences in the field of teaching English language. The pilot study has been conducted to prove the validity of the instrument in the study. Two participants were invited to take part in this study. This is to show and prove the reliability and validity of the instruments.

## 4. Data Analysis

There were 6 participants took part in this research and their gender and age can be seen in Table 1.

**Table 1.** Category of participants

Age	Male	Female
13	Participant A	Participant B
15	Participant C	Participant D
17	Participant E	Participant F

**Table 2.** Level of usage among the participants

Participant	Use of mobile devices		Comments
	Learning activity	Non-learning activity	
	Level of usage		
A	Extremely low	Extremely high	Use for social networking especially chatting with friends
B	Medium	High	Use for gaming and search for information
C	Low	Low	Use for multitasking
D	High	High	Consistent ubiquitous learner and also use for multitasking
E	Low	Medium	Use as communication tools and look for news
F	High	Medium	Consistent ubiquitous learner and social networking

In general, the six participants claimed that they did use the mobile devices in performing learning. However, the frequency of the usage varies among the participants. In the beginning, the majority of the participants used mobile devices to learn was mainly caused by curiosity. Other perceived that it is a need of owning at least one mobile device in the 21<sup>st</sup> century. After having some experience in using mobile devices, some of the participants use mobile devices to look for the things they interested in and some practicing some hobby-related learning task by using the mobile devices. Non-learning activity performed by the participant is slightly higher than the learning activity using mobile devices among the participant. However, the activities done for non-learning related tasks are varied. The level of usage among the participants can be seen in Table 2.

#### 4.1. Similarities between Male and Female

From the observation, YouTube, Google and Wikipedia are the most preferable website for the participant to learn and to obtain information. As such, all the participants used their mobile devices to access to these websites in helping them to perform assignments and projects in school due to its convenience. Besides, four participants spent relatively more hours on Sunday. It has been found that high frequency of usage also been observed on a Friday or weekends. Friday is the last day of school in a week, hence, without the time constraint teenagers spend most of their free time in using mobile devices during Friday and weekend. One of the female participant spent 6 to 8 hours in performing the learning activities using mobile devices during the weekend. This is the longest hour spent in learning activities among the participants. For the rest of the participants, who perform learning by using mobile devices, there were just spent one to two hours per day on the learning activities. This has shown that the some of the teenagers' concentration on learning using mobile devices is relatively short compared to other activities.

#### 4.2. Differences between Male and Female Participants

It has been found that three of the male participants shown low usage of using their mobile devices in performing ubiquitous learning compared to the female participants. Two male participants used the mobile devices for communicating and social networking purpose. Another male participant shows low usage of mobile devices in all type of activities. In the meanwhile, the level of usage for three female participants was range between medium to high for both learning and non-learning activities. Two of the female participants were the ubiquitous learner.

For the eldest participants, both affirmed that they will share their content knowledge with their friends because they think that it is good to share and wanted their friends to know

and being knowledgeable. However, for the rest of the participants, they said that they will not share what they learned because they thought that their friends may not be interested in the content of their learning and thus learning by using mobile device is considered more sort of personal activity.

From the findings, participant A was a passive learner. Participant A spent an average of nine hours using mobile devices in a day. He only played games during the weekends as gaming was only allowed by his parents during the weekend. He watched videos, logged into social network sites, instant messaging every day. He spent very long hours in these activities. Besides, he spent relatively much time on chatting with friends by using Facebook. He downloaded dictionaries which were "English-Chinese dictionary" and "Urban dictionary" to learn new vocabulary. This is the only learning activities performed by him using mobile devices. From the findings, participant A only used the downloaded dictionary once in a week to check on new vocabulary. In general, the main purpose for participant A used his mobile devices is for gaming, entertainment and social networking.

Although participant A spent very little time in performing learning activities using mobile devices, but he perceived that he learned vocabulary and general knowledge from the games he played using his mobile devices. One of the games is GTA gaming (Grand Theft Auto). It is the video game series and the series is set in fictional locales heavily modeled on American cities. Participant A claimed that he learned the name of a few American cities through the game. Besides, the game "Romance of the Three Kingdoms", it is a series of turn-based tactical role-playing simulation grand strategy war games enable him to understand and learn the history of the three kingdoms in China during the period of A.D 220-280. Furthermore, from the DOTA (Defense of the Ancient), he claimed that many English vocabulary that he had learned from this real time strategy video game.

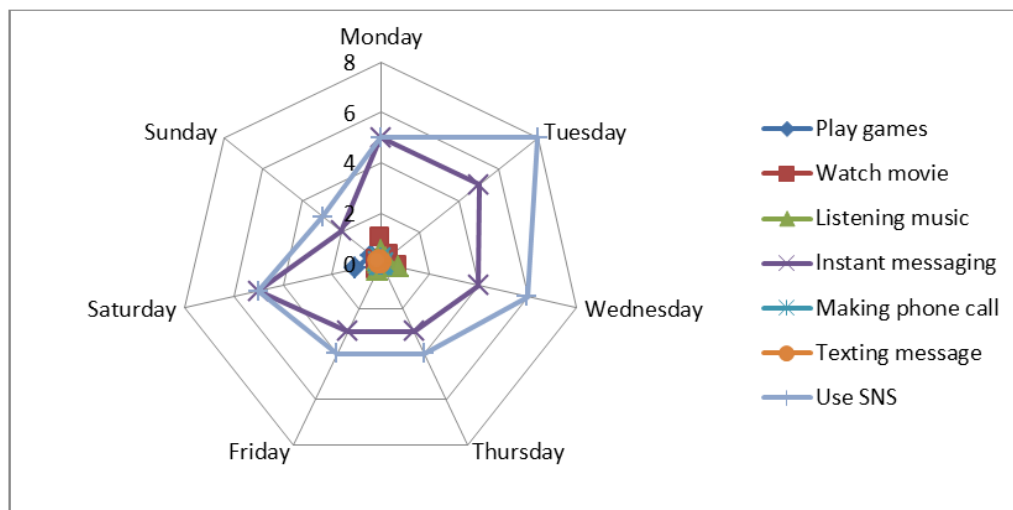


Figure 1. Usage pattern and level of usage by participant A

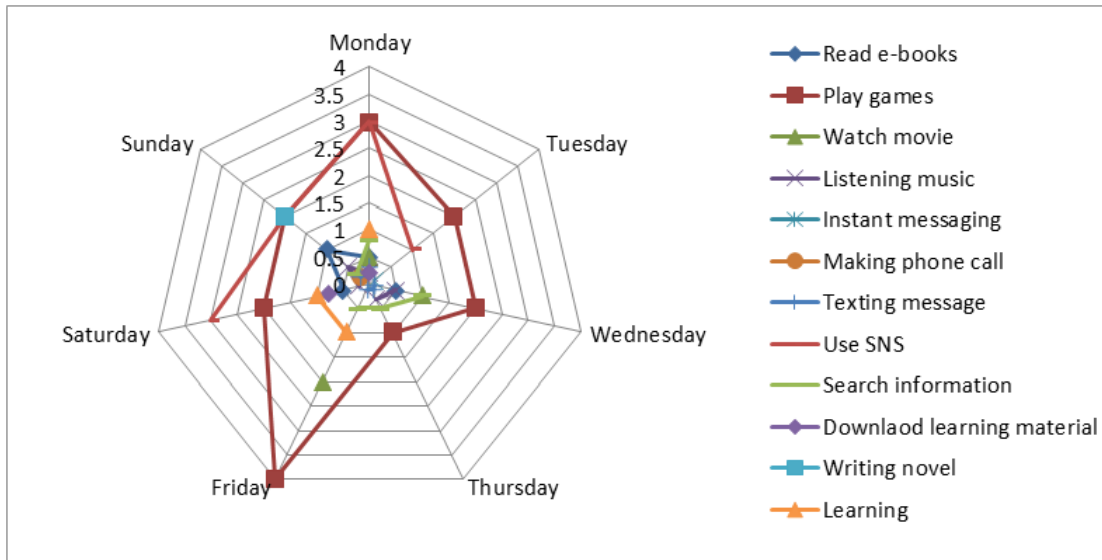


Figure 2. Usage pattern and level of usage by participant B

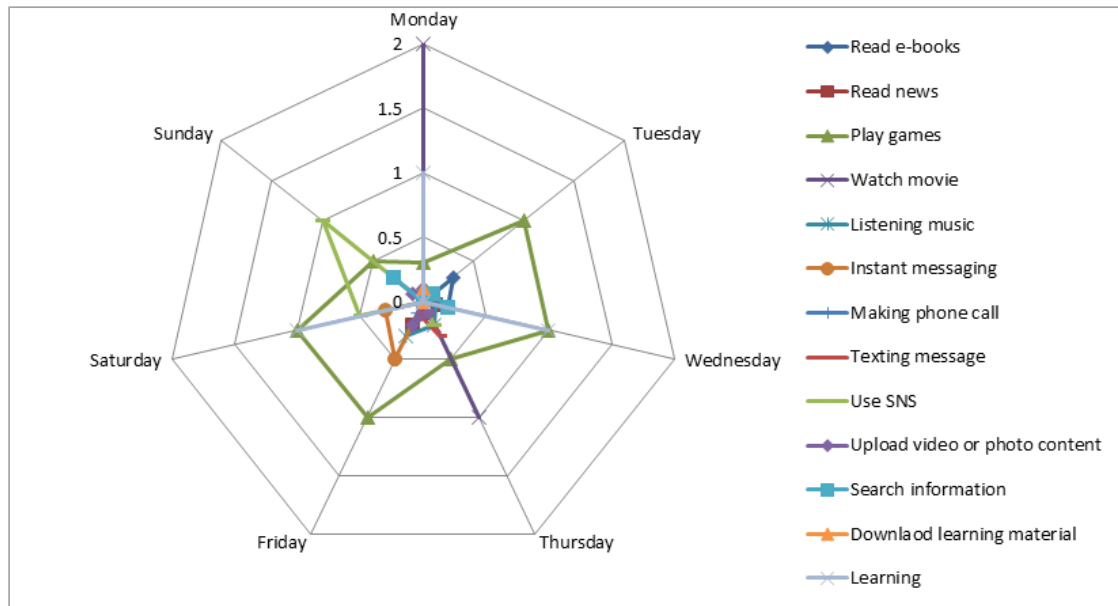


Figure 3. Usage pattern and level of usage by participant C

Participant B spent an average of five hours using mobile devices daily. The usages are relatively high from Friday to Monday. Participant B uses mobile devices for different kind of tasks. Participant B spent most of her time in gaming and social networking sites. The main daily activity performed by her using mobile devices is gaming. The time she spent on gaming is relatively high on Friday. She only performs ubiquitous learning in three days in the week and two of the days were on the weekend.

Participant B likes to use her mobile devices because the mobile devices can perform in all the activities she wanted. She perceived that learning can happen as long as she is interested. She said that “For me, learning can be at anytime and anywhere.... From reading e-books, I can see improvement in my English subject in school...I learned how to make rabbit cage, the way in designing bottle from the

YouTube video.... From the lyrics of the music, I learned English and Korean Language... Besides, it (mobile devices) helped me to translate the vocabulary. From the finding, it can be observed that mobile devices have prepared a good platform for her to perform her ubiquitous learning especially watching YouTube video to learn certain drawing skills where drawing is her hobby. Besides, the mobile devices enable her to perform school project easily because knowledge of information are all time available online. She is interested in writing novel and reading others novel from a website named “Fan fiction”. She claimed that from this website, she can practice her writing skills and improve her English grammar through reading.

The main activity that constantly performs by participant C is gaming. Participant C spent around two hours daily by using mobile devices. Participant C fully utilized the

function of mobile devices by performing various tasks even though the time he spend on mobile devices is relatively low compared to other participants. This is due to his parents only allowed him from using mobile devices for a few hours per day. In addition, the time spent on ubiquitous learning is relatively low and he only performs it on selective days. Most of the activities done by participant B were within 30 minutes. He spent the longest time in watching video form YouTube and he mentioned that he subscribed to a few entertaining videos on YouTube.

He is curious and interested in science and the universe,

hence mobile devices enables him to learn the facts about them by searching the knowledge of information online. He blended the formal and informal learning by using mobile devices. He uses the mobile devices to complete the school project. Besides, he uses mobile devices to look for information and knowledge clarification if he found any doubts in his study especially on science subject. In addition, he downloaded e-books to read as he thought that books are expensive and downloaded e-books are free of charge. He affected by his friends two years ago where owning a mobile device is a need for him as he would like to “up-to-date.”

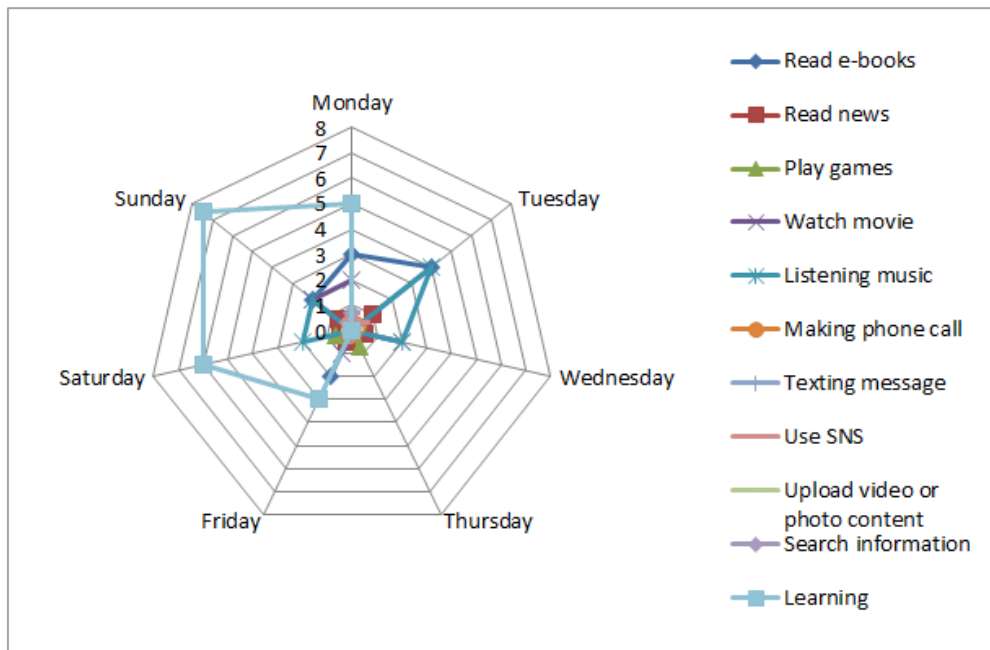


Figure 4. Usage pattern and level of usage by participant D

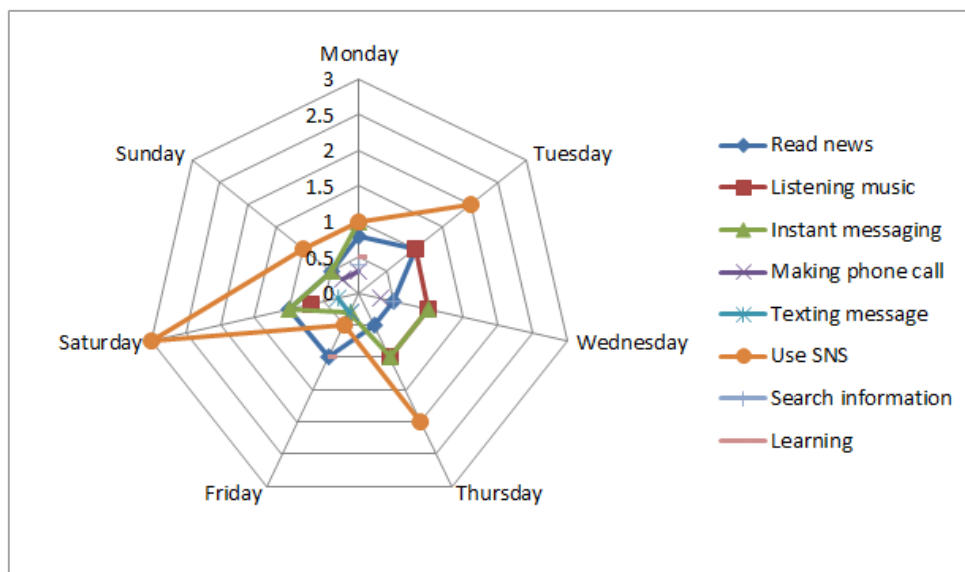


Figure 5. Usage pattern and level of usage by participant E



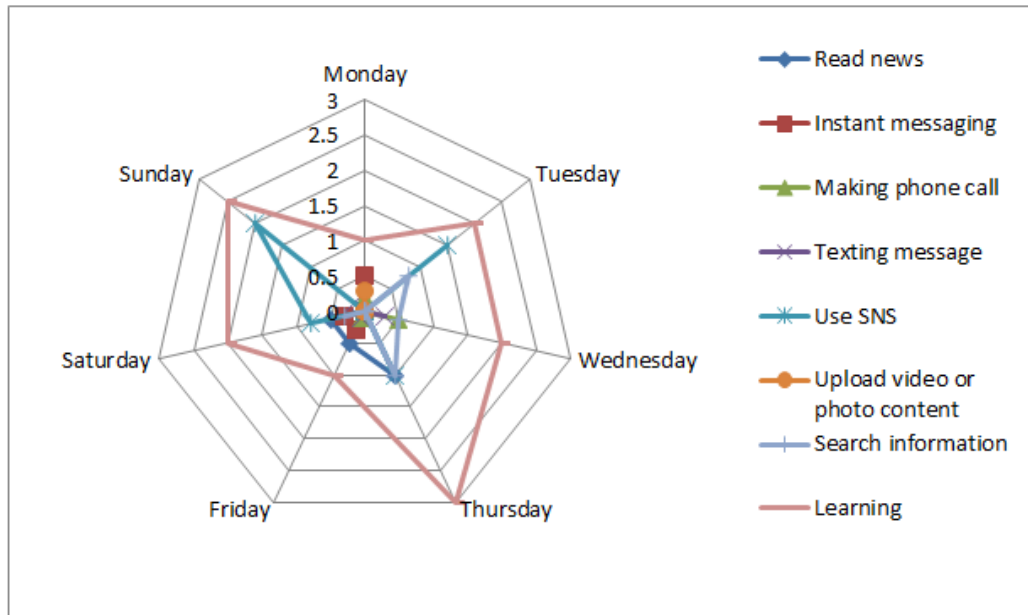


Figure 6. Usage pattern and level of usage by participant F

From the findings, participant D is an active learner by using mobile devices. Besides, she also uses her mobile devices to perform various tasks. Participant D spent around five hours daily by using mobile devices. Her usage was relatively high during the weekend. She spent most of her time in performing learning using mobile devices from Friday to Monday. Besides, she spent around two hours in performing non-learning activities in other days.

The learning activities she performs by using mobile devices are learning broadcasting skills through a website named “YYyuyin”. It is a network-based voice communication platform. The teaching activities included singing, dancing and speaking. Participant D uses this platform to learn the speaking and singing skills. She can interact with other online user and learn from each other through this platform. The teacher online will correct and comment on her performance. This is where she felt the learning is happening and she learned the technique of broadcasting. She mentioned that “*From school, I learn nothing. Like the skill of broadcasting and drawing. Teacher doesn't teach the skills but just give suggestion on our work. I have to learn by my own. Through the mobile devices, I learned the skill of singing, health information, philosophy, history.....and sometimes these things don't mention in my textbook.*” From the observation, participant D can perform the ubiquitous learning independently because of her motivation and interest; the learning task can be carried out anytime.

Participant E used his mobile device in messaging and social networking. His only mobile device was the smartphone. Participant E was the one who only owned one type of mobile device among the participants. He spent an average of two hours using his mobile device daily. He seldom uses his mobile device to perform learning activities. He claimed that the only learning activity performed by him

was searching information when he faces any doubts in his study. Besides, participant E uses Facebook as one of the source of obtaining the news. He claimed that he has to read the sports news every day. He spend relatively long hours in social networking site on Sunday.

Participant E perceived the use of mobile devices was communication tools. He spent most of his time using mobile devices to chat with his relatives and friends. Besides, for learning related activities, participant E downloaded the dictionary apps where he needs it for translation and learning new vocabulary purpose. This is the only learning related activity performed by using mobile devices. Participant E explained that he had been using the mobile device to perform ubiquitous learning in the past few years, however; it has been maintained for a short period of time due to his lack of interest. The activity performed by him before was learning origami through watching the YouTube video.

From the observation, it has been found that Participant F used her mobile devices to perform her learning consistently. She spent an average of two hours in using mobile devices to perform the learning activities. Although Participant F still uses the mobile devices to perform other non-learning tasks, however, she still spends more hours in learning related tasks. Participant F subscribes to the Korean language learning apps and English idioms apps which will remind her to learn a new vocabulary every day. This has been shown that participant F is an active learner using mobile devices. She followed the “Let's taking English” through a mobile application, and subscribed to daily idioms and vocabulary in order to receive a new words for her to learn every day. This has shown that participant F is quite disciplinary and independent in performing her learning. Besides, she also downloaded the apps in her smartphone such as “Korean pronunciation”, “English Digest”, “Radio BBC” and some games related to general learning.



Participant F claimed that using mobile devices to perform learning activities are very convenient. It meets her learning expectation and adding interesting elements in her learning. However, she felt that sometime the learning process are easily get distracted by other functions from the mobile devices such as social networking sites. She was unable to concentrate on her learning unless she has strong determination of turn off the chat in the Facebook. Besides, she is quite annoyed when the internet speed is low and she unable to perform the activities smoothly.

**4.3. Summary of Findings**

From the findings, it can be summarized that the level of usage of mobile devices varied among the participants. The participants spent averagely 5.5 hours per day and 39 hours per week in using mobile devices to perform different tasks. Most of the participants used their mobile devices before and after school. The level of usage for participants is slightly higher during the weekends compared to the level of usage in weekdays.

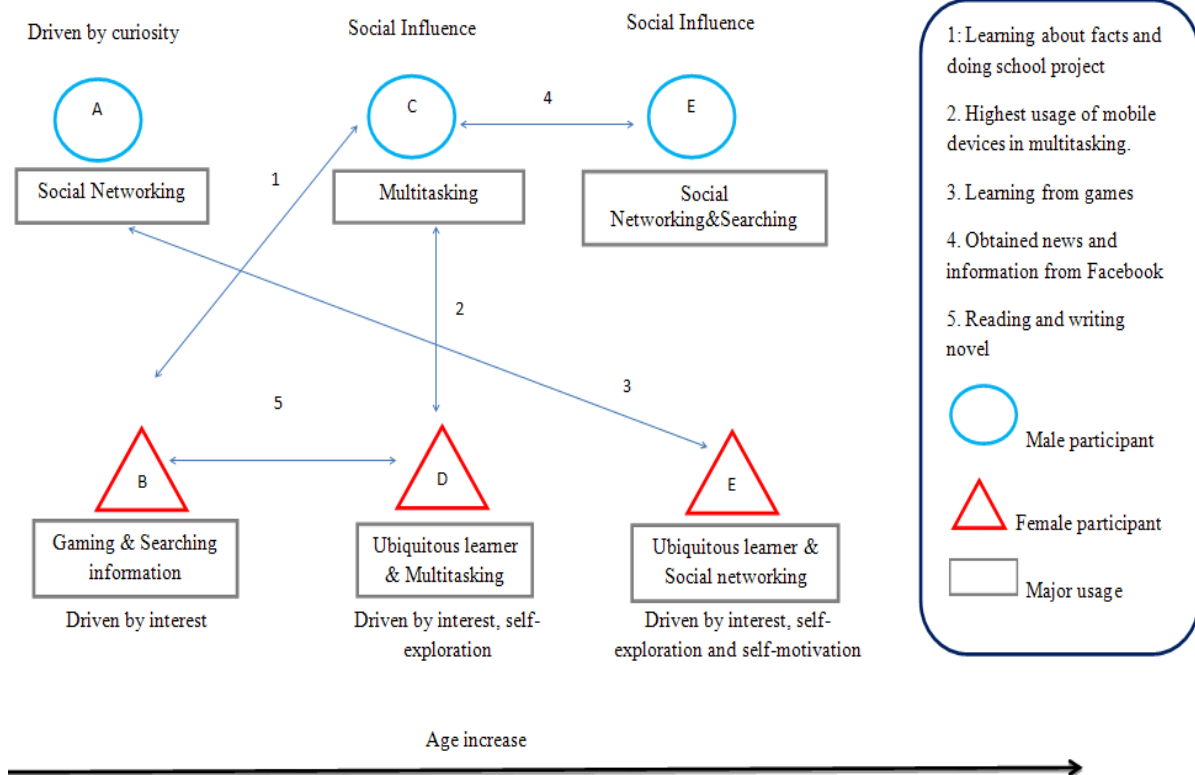
Total hour spent on the week in using mobile devices for a male teenager is relatively high among the participants. Most of his time spent on using Facebook or using instant messenger to chat with his friends in groups. The content of the discussion is regarding to the daily activities performed in school. Besides, it has been observed that the trends had shifted from paid service especially using Short Message Service (SMS) to free downloaded apps. Participants

preferred to use the free apps such as *Facebook* chat room, *whatsapp* and *wechat* to chat with their friends. Speaking using line service is only used for emergency purpose.

Using the laptop to read text is still preferable by teenagers instead of the smartphones due to the screen size of the devices. Four participants agreed that the screen of the laptop created a better reading experience for them compared to using the smartphone. On the other hand, two participants had the same viewpoint where using mobile devices will distract them and affected their concentration in learning due to the accessibility of social networking site downloaded games.

By using mobile devices to perform learning related to school subjects, all the male participants preferred teachers in schools. Two of the male participants posited that learning through “face to face” interaction is better than just using the mobile devices and one female participant thought that not all school subjects can be learned using mobile devices. In the meanwhile, all participants agreed that learning by using mobile devices based on their interest is workable.

Google search engine is the main search engine for all participants either to look for information or to search for the new learning website. All participants used this method in acquiring knowledge of information by using mobile devices. Besides, some participants downloaded language apps especially translator and dictionary in their phone as they pointed that it is easier for them to check and learn new vocabulary at anytime and anywhere.



**Figure 7.** Interrelation of activities performed among the participants

Easiness, convenience and reliability of the devices have become one of the stimulating factors influencing teenagers in using mobile devices to perform learning. On the other hand, complexity of the devices and downloaded apps, false and ambiguity information obtained have created negative learning experience to some of the participants. It has become the deterring factors for them to use mobile devices to perform learning.

Figure 7 shows the summary of the usage pattern among the participant using mobile devices. At first, male participants used the mobile devices to perform learning was due to curiosity or influenced by their friends. However, for female participants, they used mobile devices in performing learning was due to their self-interest. As the age increase, self-exploration and motivation have become other factors that stimulating them to use the mobile devices to perform the learning. Participant B and C learned about the science facts and performing school project by using mobile devices. Participant C and D used their mobile devices in performing different tasks. They were the pair who fully utilizes the functions and features of their mobile devices. Participants A and E learned through the games in their mobile devices. Participant C and E obtained news and information from the social networking site. The information and news were about the sports. Participant B and D used mobile devices to read and write a novel. Participant B read and wrote about the English novel whereas participant D read and wrote about Chinese novel. Both of them perceived that their language skills and writing skills has a significant improvement. Participant D and E were the ubiquitous learner using the mobile devices. Participant D used her mobile devices to learn the skill of drawing and broadcasting whereas participant E used the mobile device to learn English vocabulary.

## 5. Discussions

### 5.1. The Experience of the Participants

All the participants spent most of the time using their mobile devices at home as their house has the internet service. However, it doesn't seem to be any problem for them to use mobile devices in performing the ubiquitous learning at home. The majority of the participants felt that using mobile devices to perform ubiquitous learning is comfortable and convenience. There was only one participant had negative experiences when using mobile devices to perform the learning. It has been found that, in the past, the participant A failed to look for a solution to his doubts regarding the computer knowledge and it has become a deterring factor for him from using mobile devices in performing learning. He claimed that sometimes he was unable to obtain answers or solution to his questions or doubts of his problems. He sometimes will suspect the validity of the source of information. For the rest of the participants, they all have a positive learning experience by using mobile devices.

Moreover, all participants had the experience of using mobile devices to learn new vocabulary or language. Some of them downloaded the dictionary apps whereas some use Google translate to look for the definition and pronunciation of the new words. From the findings of [30], it is also shown that mobile devices are an ideal language learning tools.

### 5.2. The attitude and Perception of the Participants

Although the usage level and purpose vary among participants in using mobile devices, all of the participants possess a positive attitude towards using mobile devices in performing learning. The finding is correspond with the study done by [30] where teenagers have a positive attitude towards the usability, effectiveness and satisfaction of mobile devices because they are the generation that has grown up using these technologies. Besides, the speed of obtaining the knowledge and information is fast and the content of the knowledge is easily access to. These are the main concerns for the teenagers. For participant A, to his level of age, mobile devices did not play very important role in his learning but he still possesses a positive attitude in using mobile devices in learning in the future. Participant E perceived the usefulness of mobile devices as convenient and can bring to anywhere as it makes learning happened regardless of time and place constraint as information can be obtained at any time. All participants claimed that they will feel uncomfortable when the mobile devices are not with them for a long period of time. This has shown that mobile devices have become one of the important things in their daily life.

### 5.3. Influencing Factors

The findings from the research have revealed the integration of mobile devices into ubiquitous learning by the teenagers. The majority of the participants still used the mobile devices as communication tools, gaming tools except for two participants who have started to integrate mobile devices into ubiquitous learning for more than 3 years. Anyhow, using mobile devices to perform ubiquitous learning is much depends on individual's preference, interest and self-motivation.

Participant A claimed that the majority of his knowledge is learned from the school and had little ubiquitous learning experience using mobile devices but then the enthusiasm to learn only maintain for a few weeks. He preferred to learn "face to face" from the teacher rather than totally learn from the mobile devices. He explained that "*Face to face interaction with teachers is still important.....Teacher is there for you to explain and clear your doubt. But mobile devices, if you have any question, we cannot ask, they just 'show' you. Even though you can ask question, the response to your questions is not as fast as you ask directly to teacher. If too many question posted, I don't think they (the online host) will response to you one by one. I think I will still prefer the instantaneous response and learn through face to face from the teacher.*" This has shown that Participant A did not

convinced by the use of the mobile devices to perform the learning. This can be one of the factors deterred him from using mobile devices in performing learning.

Participant B pointed out that she can learned by using mobile devices based on her interest but she did not prefer to learn the subjects in schools by using mobile devices as she is much preferred on using books. This is because she claimed that, the information obtained online may not be as detailed as in the books. However, for the learning based on her interest, she is much preferred to use mobile devices to learn. Mobile devices are supporting informal learning based on the participant's preference and interest.

Participant C perceived that the mobile devices can be used for multitasking and the respond of obtaining information is very fast compared to using other resources such as looking for books in the library or waiting for the feedback from the teacher. This has shown that Participant C possessed good learning experience when using mobile devices. However, self-motivation in learning is still the major influencing factor for him to use the mobile devices in performing learning.

Participant D claimed that she can learn almost everything by using mobile devices and she preferred to learn from the mobile devices. *"I read novel... it helps in my writing skills... I practice my intellectual by playing chess and games on the Facebook.... I use to watch YouTube video... to learn the skills such as drawing and playing guitar...I learn pronunciation and broadcasting skills from YYyuyin....I used to listen to the song when waiting for bus."* Through the informal learning by using the mobile devices, Participant D learned the skills that cannot be learned from the schools. However, these skills are one of the workforce demand skills. Thus, Participant D has prepared herself with those skills even though she is still in the secondary school. Furthermore, the findings shown that interest and self-motivation are the major influencing factors that drive Participant D towards using mobile devices in perform learning.

Participant E showed not much interest on using mobile devices to learn because he thought that learning is the activities involved human interaction. He is much preferred face-to-face learning rather than using mobile devices. Other than this reason, he pointed out that the screen of his mobile device (smartphone) is quite small and it makes him difficult to view the text on the screen for a long period of time. As such, he seemed to be preferred in using his computer desktop to perform any activities that takes period of time.

Participant F said that *"I did not feel any difficulties in using mobile devices to perform learning as I am able to learn a lot no matter where I was...Mobile devices have made good use of my free time."* From the past learning experience, participant F perceived that mobile devices bring a lot of conveniences for her in terms of speed, time and its usability. From the past positive learning experiences, Participant F preferred to integrate the mobile devices in performing learning activities.

In short, participant's preference, interest and self-motivation are one of the key factors that influence their

decision in making use of the mobile devices to perform the activities. Besides, it can be found that some workforce demand skills such as languages, speaking skills and technical skills has been learned and practiced by some of the participants through this ubiquitous learning. Hence, ubiquitous learning can be performed and enhanced individual's skills as long as the individual has the interest and motivation to perform the learning.

## 6. Conclusions

From the observation of this research, all participants had little experience of using mobile devices in performing learning. It has been found that using mobile devices to perform ubiquitous learning is much dependent on individuals. Learning is much depending on the individual's preference, interest and self-motivation. Participants perceived that ubiquitous learning is more towards informal learning, which is much, rely on the participant's interest. From the findings, it has been shown that female participants are more active in using mobile devices in performing learning based on their interest compared to male participants. Male participant is more depend on teacher or instructor in performing learning. Whereas, female participants are much independent when learning tasks related to their interest.

Besides, mobile devices do not only support informal learning especially learning based on individual's interest but they are also used to support formal learning such as performing school project and finding extra information about the subject in order to get clarification in the study. Teenagers can look for other alternatives as the source of information. However, the disadvantages of using mobile devices were that the screen of the mobile devices and the distraction of the other feature embedded in the mobile devices especially games and social network site. This may cause the learner unable to concentrate on only learning and may distract the concentration of the learner.

The initial method used by teenagers to learn and to look for information is through the YouTube, Wikipedia and Google search. Teenagers preferred to use any of these three websites to obtain the knowledge of information in order for them to proceed further with the learning. Moreover, it has been found that, learning fact, language and skills using mobile devices are the most preferred activities by the teenagers. By learning through mobile devices based on teenagers' interest, it increased the interest of learning among the teenagers.

The result of this study suggested that self-interest, determination, motivation were the key factors to make the ubiquitous learning successful whereby if the learner encounter any difficulties, their passionate and determination will drive them to look for the solution independently. It is easier for an active learner to perform ubiquitous learning due to their passionate and determination. Passive learner needs more positive learning experience to encourage and convince them in performing the learning using their mobile

devices. The design of the mobile devices especially the screen size will be one of the factors that need to take into consideration when designing the learning material. Besides, the easiness of obtaining the content of knowledge must also take into consideration as the teenagers are concern about the speed and the simplicity. The teenagers may not want to explore further if the knowledge of content is complicated and hard to obtain. As suggested by[6], people can learn more effectively if the information is broken down into simpler and easy to comprehend form. Besides, by embedding the knowledge of content into the games, it may increase the interest of the teenagers to learn. In addition, the knowledge content must be kept simpler and shorter rather than lengthy. Besides, it will add value to the learning experience if the content is easily accessed and shared.

## 7. Recommendations

Research in the area of integrating mobile devices into ubiquitous learning is relatively new. More research continues to be needed in the future in order to obtain further understanding in the field of ubiquitous learning. A continuation of this research using different community could add more details and create new inputs into the study. Besides, research could focus on examining the factors of integrating the mobile devices into ubiquitous learning by the teenagers or to study the behavior change of the teenagers after using mobile learning. Research could also examine the significance difference between male and female teenagers in using mobile devices in performing ubiquitous learning.

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