Type of Student's Interaction in Learning Research Methodology Course

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ABSTRACT

This paper aim to investigate on type of student's interaction in learning Research Methodology course through a mobile learning environment. A qualitative research design was used in this study and data was collected from ten postgraduate students (purposive sampling) who have enrolled in a social science research course for one semester. Face-to-face interviews were conducted to collect the qualitative data to gather comprehensive information for this study. The findings and discussions in this study relate to five types of student interactions which are learner-learner, learner-instructor, learner-content, learner-self and learner-interface in the development of a mobile learning environment for a social science research course. The study concludes that student roles, instructor roles, learning tools, learning activities, and learning materials are important criteria to consider when developing student interactions, especially for social science researchers, in a mobile learning environment. In conclusion, this paper discusses four limitations and makes recommendations for future studies.

Introduction

The continuation of Malaysia's educational system is crucially dependent on higher education. With that, the Malaysian Education Development Plan 2015–2025 (Higher Education) – PPPM (PT) was created to guarantee that the nation's future generations have the proper values, knowledge, and skills to advance Malaysia's standing on the international arena. Additionally, in keeping with the Malaysia Education Blueprint 2015–2025, the higher education learning process has changed from a teacher–centered approach to a student–entered learning model. (Ministry of Education Malaysia, 2015) In addition, the 10 Leaps-based PPPM (PT) is currently in its third phase of deployment. With the intention of ensure the growth of higher education in this nation, particularly in a highly competitive economic climate, the formulation of the Malaysian Higher Education Action Plan 2022–2025 (PTPTM) is considered as very significant (Kementerian Pelajaran Tinggi Malaysia, 2022).

The 9th Leap-based PPPM (PT), which seeks to enhance access to online teaching and learning, is one of the leaps of PPPM(PT). To do this, HEIs must broaden access to high-quality instruction in accordance with Global Online Learning (GOL). Higher education institutions (HEIs) must diversify on how they use online teaching and learning tools like Massively Open Online Courses (MOOCs). Therefore, the development of online teaching and learning will enable Malaysian higher education to expand globally and enhance its reputation (Kementerian Pelajaran Tinggi Malaysia, 2022).

Among the initiatives taken for global excellence through GOL through PPPM(PT) is to encourage the offering of Learning Management System (LMS), Modular MOOCs/ Micro-Credentials / Online Distance Learning (ODL) programs at the national or international level that are relevant to global needs. In connection with that, the Department of Higher Education (JPT) has successfully implemented five programs in 2022 and has planned an increase in the number of programs that support the desire of Global Online Learning (GOL) until 2025 (Kementerian Pelajaran Tinggi Malaysia, 2022).

The development of future learning environments, which are technologically enhanced educational settings where all or part of the learning process takes place online, is the third important aspect of mobile learning in Asia. This pattern can be seen in more developed nations with robust ICT infrastructure, such Malaysia, Singapore, and South Korea,

where the government appears to be prioritising the creation of technologically enhanced learning environments that fulfil the needs of students in the 21ˢᵗ century. In addition, mobile learning is included into larger ICT strategies to create future learning environments in these countries even though not particularly addressed at the policy level (UNESCO, 2012)

As reported by UNESCO (2013), where smartphones become more widely available in market, they will become increasingly practical in nonformal education. Meanwhile, undergraduate students are increasingly using smartphones in classroom activities for formal education (Fuller & Joynes, 2015; Ifeanyi & Chukwuere, 2018; Jesse, 2016). Besides that, it has been predicted that 5 billion people will be using mobile devices to access the internet by 2025 due to increasing mobile device usage and the development of mobile connectivity to 5G technologies (GSM Association, 2019). Although those who are technology-savvy may be familiar with mobile learning as a learning approach, using this approach requires the right infrastructure and educators with a foundation in teaching (UNESCO, 2013).

Many nations have been setting up their infrastructure and supporting the use of mobile devices in various areas of the education sector, including China, Singapore, Taiwan, and Malaysia (UNESCO, 2012). In addition, mobile devices allow for situated learning, or instruction in actual situations while looking up relevant data to support instruction or improve the on-site experience (Cheong et al., 2012; Domingo & Garganté, 2016; Gikas & Grant, 2013). Besides that, there are additional opportunities to improve learning experiences thanks to the developing Internet of Things (IoT) (Dachyar et al., 2019). Therefore, learning spaces are now more diverse than just inside the classroom because mobile learning can take place in flexible time and place (Demir & Akpinar, 2018; Sampson et al., 2013). With the support of a mobile learning environment, this paper objectives to investigate the types of learning interactions among social science research students.

Literature Review

This paper will discuss about type of students' interaction in learning process through mobile learning and Research Methodology course including related issues on previous research.

Mobile Learning

Mobile learning is defined as learning that takes place anywhere, at any time, using a mobile device (Embi & Mohd Nordin, 2013; Shih et al., 2010). Learning on mobile devices requires the integration of many different elements, including those related to the device, the learner, the social aspect, the usability of the device, interaction learning, and social technology as show on Figure 1 (Koole, 2009).
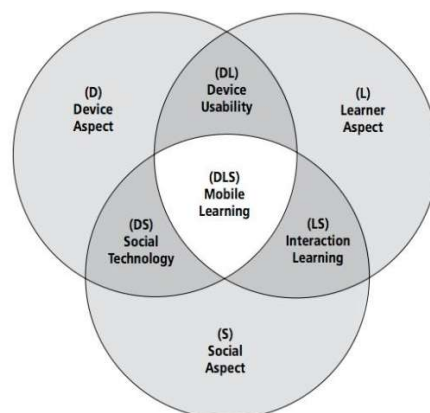
Figure 1. The FRAME model (Koole, 2009)

Table 1 shows five aspect and criteria of mobile learning as mentioned by Koole (2009). The device aspect (D) refers to the "physical, technical and functional characteristics of a mobile device". It is important to assess these characteristics because mobile learning devices provide the interface between the mobile learner and learning tasks, it also related to device usability (DL) intersection. In addition, input and output capability, file storage and retrieval,

processor speed, and error rates also include in device aspect (D). The learner aspect (L) involved five criteria which are prior knowledge, memory, emotion, motivation, context and transfer, and discovery learning.

The social aspect (S) has two criteria such as (1) social interaction; and (2) conversation and cooperation. Social interaction's criteria referred to agreement on the meaning of signs and symbols may affect reinforcement of social and culture belief, and behaviours. Meanwhile, criteria of conversation and cooperation has concept of social constraint, where miscommunication might be happened if four elements (quality, quantity, relation, and manner) not compatible to each other.

The device usability intersection (DL) is the intersection of Device aspect (D) and Learner aspect (L). There are four criteria of DL which are portability, information availability, psychological comfort, and satisfaction. Meanwhile, the interaction learner (LS) intersection of (L) and (S) aspects. There are three criteria of LS which are interaction, situated cognition and learning community. On the other hand, the social technology intersection (DS) is the intersection of Device aspect (D) and Social aspect (S). There are three criteria of DS which are device networking, system connectivity and collaboration tools.

Table 1. Aspects and criteria of mobile learning

Aspect	Device aspect (D)	Learner aspect (L)	Social aspect (S)	Device usability intersection (DL)	Interaction learner Intersection (LS)	Social technology intersection (DS)
Criteria	• Physical characteristic • Input capabilities • Output capabilities • File storage and retrieval • Processor speed • Error rates	• Prior knowledge • Memory • context and transfer • Discovery learning • Emotion and motivation	• Conversation and Cooperation • Social Interaction	• Portability • Information availability • Psychological comfort • Satisfaction	• Interaction • Situated cognition • Learning community	• Device networking, • System connectivity • Collaboration tools.

The study of mobile learning in higher education conducted in 2006–2018 by Sophonhiranrak, (2021) shown application (43) is the highest usage for mobile learning tool, followed by image/video (22), social media (20), SMS (16), search engine (13) and email (12). Meanwhile VLE/mixed reality, RSS and Podcast less favour as learning tools as shown in Figure 2. In addition, compatible or easy to use (31), attitudes (24), skills (23) app designing/ resources (20) and tool readiness (20) are the Top 5 the reasons implementation of mobile learning in higher education institution. Previous study reported online resources can give students additional chances to interact and collaborate deeply with their teachers, peers, and course materials, which will help them develop their critical thinking abilities (Abdul Razzak, 2016).
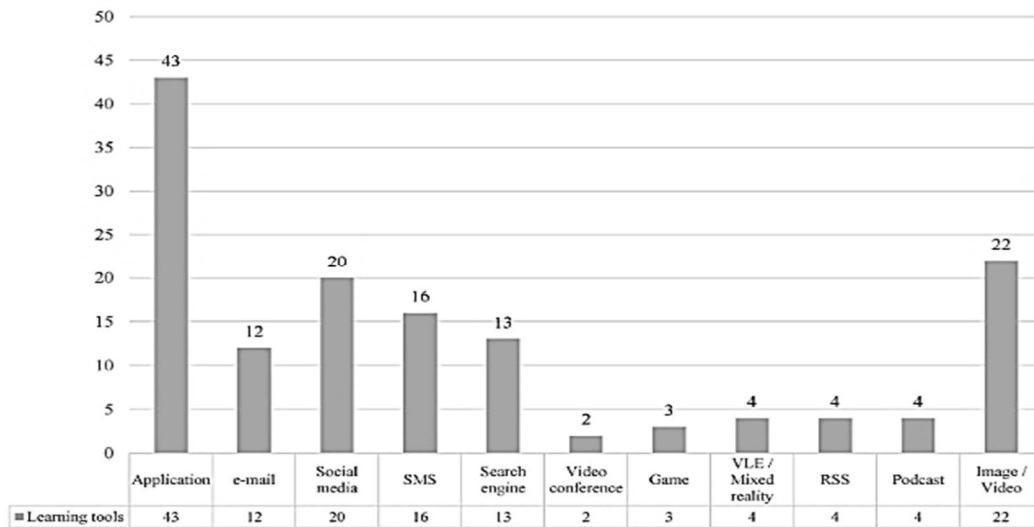
Figure 2. Example of mobile learning tools in higher education (Sophonhiranrak, 2021)
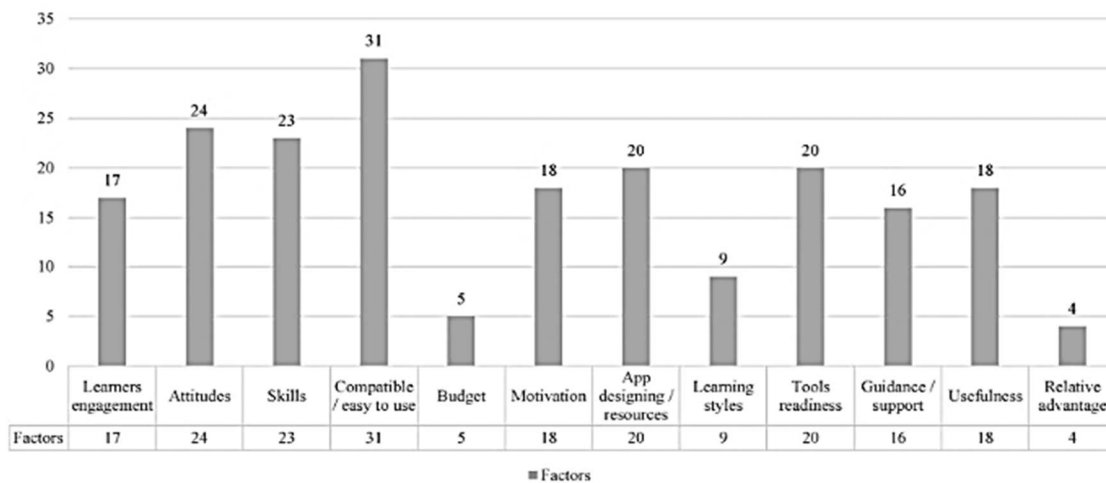
Figure 3. Factors influencing usage of mobile learning in higher education (Sophonhiranrak, 2021)

A study of Hand Phone Users Survey (HPUS) 2021 involved 1,916 respondents was reported an increase in the use of smartphones to access the Internet which is 99.3% in 2021 as show on Figure 4. It demonstrates that more smartphone usage is a sign of significantly greater online connectivity in Malaysia. Meanwhile, smartphone users engaged in more social and communication-based activities than transaction-based ones: text messaging (82,9%), social networking (78,9%), voice calls (78.6%), and video calls (71.0%) were among the top daily activities, while shopping (41.1%) and banking (38.9%) were among the least popular (Malaysian Communications and Multimedia Commission, 2022).
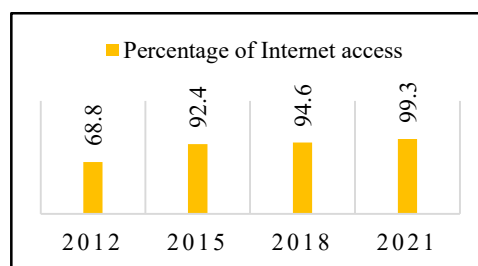
Figure 4. Percentages of users that use smartphones for Internet access

Besides that, HPUS 2021 reported that Malaysian in the age group of 20-34 years old (93.7%) is the highest adoption rate of smartphone users; followed by those below 20 years old (95.6%), 35-49 years old (93.9%), 50-64 years old (92.4%), and 65 years old and above (82.3%). In addition, smartphone users are among employed (96.3%), student (95.7%), self-employed (94.9%), unemployed (91.7%), and Pensioner (88.2%) as illustrated in Figure 5
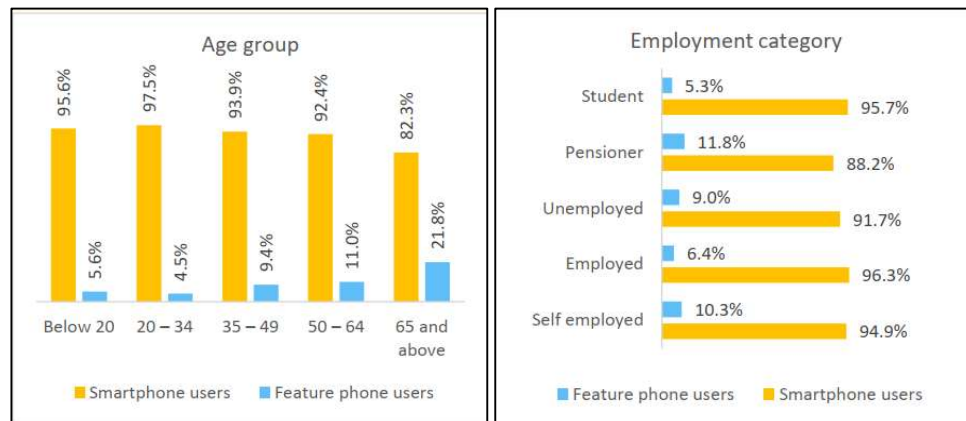

Figure 5. Adoption rate of smartphone and feature phone users by demographics

Type of students' interaction in Learning Process

According to Collins & O'Brien (2011), "interaction" is defined as a transaction that takes place between a person (kid or adult), person-person, person-materials, or person-environment. The most salient aspect, according to Vygotsky (1978), is that students gain knowledge based on their experiences with the subject matter, particularly through social interaction. As listed in Table 2, previous research has documented a variety of interactions that students had during learning.

Table 2. Type of learning interaction

Authors	Types of interaction
(Moore, 1989)	learner-learner, learner-teacher, learner-content
(Anderson & Garrison, 1998)	learner-learner, learner-teacher, learner-content, teacher-teacher, teacher-content, and content-content
(Hirumi, 2002)	learner-learner, learner-instructor, learner-content, learner-other and learner-environment
(Chou, 2003)	learner-learner, learner-instructor, learner-content and learner-interface
(Hsinyi et al., 2007)	learner-learner, learner-instructor, learner-content, learner-interface, learner-context and learner-self (intra-personal)
(Chou et al., 2010)	learner-learner, learner-instructor, learner-content, learner-interface and learner-self

According to Moore, (1989), there are three different forms of interactions: learner-learner, learner-teacher, and learner-content. Meanwhile, three other types of interaction—teacher-teacher, teacher-content, and content-content—were later included (Anderson & Garrison, 1998).In contrast, other scholars have developed various types of learning interactions for example learner-other and learner-environment (Hirumi, 2002); learner-interface (Chou, 2003; Chou et al., 2010; Hsinyi et al., 2007); learner-self (Chou et al., 2010; Hsinyi et al., 2007); and learner-context (Hsinyi et al., 2007). This paper briefly discussed about learning interaction in social science research on next section. The difference in interaction introduced by Moore is suitable for traditional learning. But developments in the field of information and communication technology have supported student interaction with online learning materials. This can be seen in Chou's study of learning interaction through web-based technology (Chou et al., 2010).

Social Science Research

Previous study at one of the public universities in peninsular Malaysia reported that master by taught course student are required to complete a total of 45 Credit Hours. They also must learn one of faculty's compulsory courses which

is Social Science Research that equivalent to 4 Credit Hours. Table 3 shows the Social Science Research's syllabus which are quantitative research, qualitative research, and mixed-method research (Yaacob et al., 2019).

Table 3. Syllabus of Social Science Research (Yaacob et al., 2019)

Syllabus		Topics
Quantitative Research	1. Compare quantitative VS qualitative methods 2. Type of Quantitative design: survey, experimental, ex post facto, correlation, multi dimension, exploratory 3. Variable 4. Conceptual & Theoretical Framework 5. Internal and external validity	6. Ethics 7. Issues Background of Problem 8. Statement of Problem 9. Methodology: Population and sampling 10. Instrumentation 11. Data Collection: Testing and Survey 12. Data analysis and interpretation 13. Reporting
Qualitative Research	1. Problem Formulation in Qualitative Study 2. Issues 3. Problem Statemen 4. Research Questions 5. Research Designs in Qualitative I: Ethnographic, Historical, Developmental 6. Research Designs in Qualitative 2: Narrative, Action Research	7. Research Designs in Qualitative 3: Case Studies, Triangulation, Role Play, Personal Construct 8. Population/Sampling and Data Collection 9. Respondents 10. Instrumentation
Mixed-Method Research	1. Types of Mixed-Method Designs 2. Characteristics 3. Steps 4. Data Analysis	

This course is intended to teach postgraduate students some crucial ideas and abilities related to research technique. In summary, this course will give the students the tools they need to recognise and use the best research methodologies for planning, carrying out, and evaluating the completed study. The best practices for formulating clear issue statements, quantifiable goals, and organised research scopes will be given to the students. Students are given a detailed explanation of the objectives of creating effective research designs and the connections between research methodologies and research designs. Additionally, this course goals to teach students how to gather and analyse data. lastly, the skills and methods needed for creating a research proposal and thesis, as well as the oral examination for the final thesis, will also be introduced to the students.

Methods

This study was carried out through qualitative research design to investigate on five aspects of student's interactions in development of mobile learning environment for social science research course. Besides that, this paper only focuses on interaction which one of criterion of Interaction Learner Intersection (LS) in FRAME model. The interaction criteria related to "different kind of interaction that can stimulate learning to varying level of effectiveness depending on the situation, learner and task". For example, learner-learner, learner instructor, learner-content, computer –based learning, intelligent tutoring system and zone of proximal development (Koole, 2009). This paper also emphasis on type of learning interactions by Chou et al. (2010) and as guideline for research instrument. Ten respondents have involved in this study. They are postgraduate students who have enrolled in social science research course for one (purposive sampling technique). All respondents are in range of 24 to 28 years old and in line with the HPUS 2021 study where users in the age group of 20-34 years old (93.7%) is the highest adoption rate of smartphone users (Malaysian Communications and Multimedia Commission, 2022). Face-to-face interviews were also used to collect qualitative data with the intention of gather rich information for this study (Creswell, 2014). All respondents have used seven mediums (such as E-learning, WhatApps, Facebook, E-mail, YouTube, Blog and SMS), for communication and information delivery between student and lecturer; and details have been discussed in previous study (Yaacob et al., 2019). All respondents signed the researcher's written consent form and gave their consent for all data collecting procedures, including audio recording of interviews. The semi-structured type of interview questions was being used. This article is exploring respondents' preferences in learning interaction for research methodology course using various type of learning interaction based on Chou et al. (2010):

a) Learner-learner interaction
b) Learner-instructor interaction
c) Learner-content interaction
d) Learner-self interaction
e) Learner-interface interaction

Analysis

In this study, the researcher has documented interview data and analysed through content analysis methods (Elo & Kyngäs, 2008) which are preparation of data, organisation of data and reporting of data. In the context of this study, the preparation of data step which are i) required the researcher to document, review, and read all interview data; ii) conducting the unit of analysis which is the message because the data is in the form of a sentence; and (iii) the researcher will analyze the type of manifest content (create a category). After that, the research conducting the organisation of data step that involvement of open coding and create categories for themes and subthemes. Type of interaction based on Chou et al. (2010) has been used as themes and sub-themes in the coding process, namely (i) learner-learner, (ii) learner-instructor, (iii) learner-content, (iv) learner-self, and (v) learner-interface. Lastly, the the qualitative data obtained has been reported in the form of a table.

Results and Discussion

This section explains the results based on five type of student's interactions which are learner-learner, learner-instructor, learner-content, learner-self, and learner-interface in development of mobile learning environment for social science research course.

Finding on type of student's interaction: learner-learner interaction

The learner-learner interaction in this study refers to a learner interacting with other learners through a mobile learning environment. As summarized based on Table 4, finding shows respondents' preference for learner-learner interaction in social science research course was influenced by four aspects: bulletin board systems (BBSs) (R1, R8), social tools (R3), sharing and emulation (R1, R2, R3, R4, R5, R6, R8, R10) and grouping (R5, R6, R9, R10).

Table 4. Respondents' preferences for learner-learner interaction

Aspect (code)	Description	Feedback (unit of meaning)
Bulletin board systems (BBSs)	A built-in BBS enabling learners to post or to view information	• allow students and friends to share information (R1) • every student needs to share what he/she understands and needs to do such as dialogue or material (R8)
Social tools	Built-in tools that connect learners with peers by textual or visual portrayals; tools include self-introduction, contact information, or emoticons	• chat or messaging feature in app (R3)
Grouping	A function for classifying learners into groups	• tasks are distributed by group (R6) • provide group assignment (R5) • assign group work that requires students to have an online discussion (R9) · • provide a grouping environment to discuss specifically for this subject (R10)
Sharing and emulation	A function enabling learners to exchange learning experiences or learning outcomes with peers	• create a "chat" room to allow students and friends to discuss like the "Waze" app (R1) • a platform that allows them to discuss (forum/ chat/ discussion board) (R2)

- forum to discuss any confusion or ask questions (R3)
- discussion board/ forum with topic/ have thread (not like Facebook-Messager, don't have 'topic') (R4)
- provide discussion and forum (R5)
- discussion to create a Research Question in the e-Learning forum (R6)
- the discussion is more mind-on (R8)
- every student needs to give an argument (R8)
- discuss specifically for this subject in order to gain new knowledge (R10)

The finding shows BBS aspect enabling learners sharing information from their own understanding (R1, R8). Meanwhile, social tools aspect for learner-learner interaction available through chat or messaging feature in mobile app (R3). This aspect allows connection of learners with their peers through textual or visual portrayals which include self-introduction, contact information, or emoticons (Chou et al., 2010).

Grouping aspect means a function for classifying students into small groups (Chou et al., 2010). Students interact with members of their own groups that they form specifically for a social science research course (R10). The benefit of grouping is that students can quickly receive information about tasks and assignments that have been distributed for their group through online (R5, R6, R9).

The sharing and emulation aspect mean a function enabling learners to exchange learning experiences or learning outcomes with peers (Chou et al., 2010). This aspect important for online discussions (R1, R2, R3, R8, R9, R10) and group task assignment (R5, R6, R9), where students are allowed to debate, express their own opinions, and use critical thinking to learn new information about social science research. Utilizing a range of mobile applications, these learning activities can be incorporated into courses. For instance, students can share photos they've taken through a messenger app with their peers, allowing them to converse and exchange ideas about the shared photos (Sophonhiranrak, 2021).

The finding shows implementation of learning approach is recommended for learner-learner interaction as mentioned by R9, "*integrate social presence in the online learning environment*". The learning tools such as chat/messenger (R1, R3), forum/discussion board (R2, R4), and mobile apps (R3, R7) are suggested by respondents for learner-learner interaction. Study by Yaacob et al. (2019) reported that communication medium such as blog, e-Learning, e-mail, Facebook, SMS, WhatApps and YouTube have been used by students in learning social sciences. In addition, R7 highlight that students should be able to use mobile device as learning tools that do not require a strong Internet connection because internet connectivity is one of barrier in mobile learning (Sophonhiranrak, 2021).

Finding on type of student's interaction: learner-instructor interaction

The learner-instructor interaction in this study refers to learner can interact with instructor by using mobile learning environment in social science research course. As summarized based on Table 5, finding shows respondents' preference for learner-instructor interaction was influenced by six aspects: bulletin board systems (R1, R2, R5, R7,); synchronous communication (R4, R8); social tools (R2, R3, R4, R7, R8); grouping (R6); assignment handling (R1, R2, R5, R6, R8, R9, R10); and online examination (R4).

Table 5. Respondents' preferences for learner-instructor interaction

Aspect (code)	Description	Feedback (unit of meaning)
Bulletin board systems (BBSs)-	A built-in BBS enabling instructors and learners to post or to view information (*you login to read messages)	- allow students and facilitator to share information (R1, R2) - students will try to access to view instructor's post via mobile (R5)

		• provide 'apps' that can upload reading notes/tutorials (R7)
Synchronous communication	A built-in mechanism enabling instructors and learners to chat synchronously	• two-way interaction (R8) • private chat sessions (R4)
Social tools	Built-in tools that connect learners with instructors by textual or visual portrayals; tools include self-introduction, contact information, or emoticons	• connecting students with instructor through forum/discussion board (R2, R4, R8) and mobile apps (R3, R7) • messaging feature inside the app (R3)
Grouping	A function for classifying learners into groups	• students are receiving tasks in their group (R6)
Assignment handling	A mechanism enabling learners to hand in their assignment and to receive instructors' feedback	• assignment feedback/comments via mobile (R5) • instructor initiates a topic that can be discussed for example a simple task to draft a statement of problem (R6) • allow students and facilitator to discuss (R1, R2) • interaction is more focused on research by giving examples of research, past research situations (R8) • having someone to facilitate/ moderate the communication (R9) • moderator / facilitator to easily be reached by students by providing fast feedback (R9) • involve instructors in online discussions with students (R10)
Online examination	A function enabling learners to assess learning effectiveness by accessing online examinations that feature instructors' immediate feedback	• instructor can monitor student's result (R4)

The built-in BBS enabling instructors and learners to post or to view information (Chou et al., 2010) where students will try to access to view instructor's post via mobile (R5), allow students and facilitator to share information (R1, R2). The synchronous communication aspect is a built-in mechanism enabling instructors and learners to chat synchronously (Chou et al., 2010), where allow two-way interaction (R8) and private chat sessions (R4) to support learner-instructor interaction.

The social tools mean built-in tools that allows connection of connect learners with instructors through textual or visual portrayals which include self-introduction, contact information, or emoticons(Chou et al., 2010). Social tools such as chat/messenger (R1, R3); forum/discussion board (R2, R4); and mobile apps (R3, R7) are suggested by respondents for learner-instructor interaction and also mentioned by other studies (Pedro et al., 2018; Soh, 2012; Sophonhiranrak, 2021; Woodill, 2011; Yaacob et al., 2019).

The grouping aspect mean a function for classifying learners into groups by instructor (Chou et al., 2010). Online grouping of students is made possible by this function for instructor. The instructor can be contacted directly by the students, and they can request assignments or information only for particular groups. Additionally, it makes it simpler for instructor to instruct students and give them information for a variety of assignments.

Assignment handling mean a mechanism enabling learners to hand in their assignment and to receive instructors' feedback (Chou et al., 2010). During teaching and learning activities, the involvement of instructor/facilitator/monitor and their roles are crucial for types of learner-instructor interaction as emphasised by Swain et al. (2021). In this study, instructor/facilitator/monitor should initiate a topic that can be discussed (R6); managing two-way communication with their students (R8, R9); and give feedback/ comment on students' assignments via mobile (R5) during teaching and learning proses. In mobile learning, discussion, collaboration, and feedback were the most frequently reported learning activities (Sophonhiranrak, 2021).

Consequently, in order to understand social science research, preparation of learning materials is not only necessary in the form of theoretical notes, but also in the form of real-world examples. The finding also suggested an instructor providing examples of social science research (R8), examples of situation from past research (R8), and give simple task such as student are required drafting a statement of problem (R6). Other study agreed that using a mobile device to search for relevant information to verify information or improve the on-site experience allows for situated learning or learning in real-world contexts (Cheong et al., 2012; Domingo & Garganté, 2016; Gikas & Grant, 2013).

Online examination aspect means a function that allows students to access online tests with immediate feedback from instructors to gauge their learning effectiveness (Chou et al., 2010). This function allows the instructor to monitor their student's result (R4). On the other hand, the respondents also suggestion teaching and learning activities to support learner-instructor interaction such as discussion (R1, R2, R4, R8, R9 R10); group assignment (R5, R6, R8); sharing information (R1, R7), facilitator/moderator/ instructor involvement (R1-R10) and role (R4, R6, R9); provide learning materials (R5, R6, R7, R8); comments/feedback (R5,R9) and reward (R3, R9). When engaging mobile devices, educators should carefully consider instructional design to support teaching approaches that motivate students to use their devices for the right goals as well as the capabilities of the devices that are available (Sophonhiranrak, 2021).

Finding on type of student's interaction: learner-content interaction

The Table 6 shows respondents' preferences for learner-content interaction to occur in the social science research course. The learner-content interaction means learners can access multimedia learning contents by using mobile learning environment. As summarized based on Table 6, finding shows the learner-content interaction involve four aspects which are links to related educational systems (R7); links to related learning materials (R1, R2, R4, R5, R6, R7); multimedia presentation (R3, R4, R8, R9, R10); and sweepstakes (R3, R9).

Table 6. Respondents' preferences for learner- content interaction

Aspect (code)	Description	Feedback (unit of meaning)
Links to related educational systems	A list of links to related educational platforms or databases	• link of journal suitable to social science (R7), for example ProQuest, ScienceDirect, Scopus, SpringerLink, Web of Science, SAGE Journals, Taylor & Francis Online, Emerald Insight
Links to related learning materials	A list of links to related learning materials	• link access to notes (R1, R2, R4, R6) • prepare quiz and exercise (R5) • interesting teaching/learning materials via mobile (R5) • access to video related to learning topics (R7)
Multimedia presentation	Media (text, graphics, animation, audio, etc.) and content that use a combination of different presentation forms, including a combination of text, audio, graphics, animation, and video	• animation type notes (R4), • interesting activities and exercise (R3) • easy to understand (R8, R10) • comprehensive note (R8) • concise notes (R8, R10) • attractive looking (R3, R9)

Sweepstakes
- reward (R3)
- motivate/ appraise (R9)
- unlock badges for achievements /rewards (R4)

Firstly, the term "links to related educational systems" refers to a list of links that related to educational database or platform (Chou et al., 2010). Finding reported learning content should be provided with several links of journal suitable to social science (R7), for example ProQuest, ScienceDirect, Scopus, SpringerLink, Web of Science, SAGE Journals, Taylor & Francis Online, Emerald Insight. Secondly, the term "links to related learning materials" refers to a list of links that related to learning material (Chou et al., 2010) of social science research syllabus. Finding reported link access to notes (R1, R2, R4, R6); prepare quizzes and exercises (R5); interesting teaching/learning materials through mobile apps (R5) and access to video related to learning topics (R7) are notable in this type of learner-content interaction.

Thirdly, the term "multimedia presentation" refers to media and content that incorporate a variety of presentation formats, such as text, audio, graphics, animation, and video (Chou et al., 2010). Findings demonstrate how learner-content interaction is influenced by animation-style notes (R4); interesting activities and exercise (R3); easy to understand (R8, R10); comprehensive note (R8); concise notes (R8, R10) and attractive-looking material (R3, R9). Fourthly, the term "sweepstakes" define as event that are held to draw students and promote their participation such as an award for the first learner to answer a particular content-related problem (Chou et al., 2010). Finding shows respondents' preferences by giving special points or rewards towards student's involvement in online discussion (R3); unlock badges for achievements or rewards (R4); and motivate or appraise students to participate in online discussion (R9). The results of this study are in line with Yaacob et al. (2019), where students should be "*give special points for socializing with friends*" as its important to increase motivation in learning social science research.

Finding on type of student's interaction: learner-self interaction

As summarized based on Table 7, finding shows nine aspects that contributed to learner-self interaction from respondents' preference in the social science research course. The learner-self interaction means ability to monitor own-self learning progress with facilitated by mobile learning environment function. The nine aspects are learning dashboard (R3, R6, R7, R8, R10); grade-status tracking (R2, R4, R7, R10); diary and reflective journal (R9); calendar and schedule reminder (R3); task-list (R6, R7); individualized test/quiz (R8, R10); learning-completion tracking (R2, R5); assignment-completion tracking (R2); and examination-status tracking (R10).

Table 7. Respondents' preferences for learner-self interaction

Aspect (code)	Description	Feedback (unit of meaning)
Diary and reflective journal	A built-in form for learners to write diaries and reflective journals	• space for self-reflection (R9)
Calendar and schedule reminder	A built-in calendar to set up schedules and reminders	• reminders to use the app in certain periods (R3)
Task-list	A function enabling learners to check the number and status of learning tasks	• provide a learning timeline (R6) • provide mobile 'apps' that contain list of assignment/quiz/tests (R7)
Individualized test/quiz	The personalized test/quiz for each individual learner	• exercises and activities that can test knowledge (R8) • provide exercises/activities that allow students to directly see their achievement scores (R10)
Learning-completion tracking	A function that tracks learning paths and learning progress	• learning completion (R2) • show grade progression and improvement (R5)

Assignment-completion tracking	A function that tracks the status of assignment submission	• student can see their learning completion (R2)
Examination-status tracking	A function that tracks the status of examinations, including in-class quizzes and term exams	• that allow students to directly see their achievement scores (R10)
Grade-status tracking	A function that tracks the status of grade scores	• can see the score (R2) • ranking to see your performance (R4) • provide mobile 'apps' that contain assignment scores (R7) • allow students to directly see their achievement scores (R10)
Learning dashboard	A single view of all learning events, such as records of assignment completion, messages contributed to the discussion, materials-viewed, and time spent on learning tasks	• profile or dashboard that displays personal achievements (R3) • display students' performance records (can only check their own performance) (R6) • look at self-achievement (R8) • allow students to directly see their achievement scores (R10) • provide mobile 'apps' that display assignment/quiz/test/upload assignment scores (R7)

The finding shows space for self-reflection should be provided (R9) for them to write to write diaries and reflective journals while following the social science research course. Besides that, calendar and schedule reminder allow student get notification of reminders to use the app in certain periods (R3). In addition, respondents mentioned that the mobile learning should has function enabling learners to check the number and status of assignment/quiz/tests (R7) and learning timeline (R6), so that students can complete their assignments in accordance with the planned timeline.

Individualized test/quiz aspect means the personalized test/quiz for each individual learner (Chou et al., 2010). The findings recommended such as exercises and activities that can test knowledge (R8) and provide exercises/activities that allow students to directly see their achievement scores (R10). Meanwhile, learning-completion tracking aspect means a function that tracks learning paths and learning progress (Chou et al., 2010). The findings recommended such as learning completion (R2) and show grade progression and improvement (R5).

Assignment-completion tracking aspect means a function that tracks the status of assignment submission (Chou et al., 2010). In this study, it is recommended that student can see their learning completion (R2). Meanwhile, examination-status tracking aspect means a function that tracks the status of examinations, including in-class quizzes and term exams (Chou et al., 2010), where it is allow students to directly see their achievement scores (R10)

Learning dashboard aspect means a single view of all learning events, such as records of assignment completion, messages contributed to the discussion, materials-viewed, and time spent on learning tasks (Chou et al., 2010). In the context of this study, profile or dashboard displays their personal achievements (R3, R6, R8, R10) and display their scores of assignment/quiz/test (R7).

Finding on type of student's interaction: learner- interface interaction

As summarized based on Table 8, finding shows six aspects that contributed to learner-interface interaction to occur in the social science research course. The learner-interface interaction means learners can access the desired information with a user-friendly interface in a mobile learning environment system. The six aspects are multimedia presentation (R3, R4, R5, R6, R7, R8); sitemap (R3, R4, R9); user guidance for a system (R1, R3, R9); fixed frame (menu) design (R2, R7); software downloading/ uploading (R1, R2); and links to related educational systems (R10).

Table 8. Respondents' preferences for learner-interface interaction

Aspect (code)	Description	Feedback (unit of meaning)
Fixed frame (menu) design	A list of menu items from which learners can choose any learning contents and functions interface	• provide menu, button, text area (text input) (R2) • the 'Apps' can be in the form of a book icon (outer icon) and menu bar (inner icon) (R7)
Sitemap	A list of pages of a Web site accessible to learners	• easy to navigate (R3) • uniformity in navigation (R4)
Software downloading/ uploading	Learners can freely download/upload materials from the system for a particular learning purpose	• teaching content (notes) can be easily downloaded. (R1, R2) • upload assignments/tasks (R2)
User guidance for a system	A guidance feature that facilitates system use	• provide a "user-friendly" application for students to feel easy (R1) • applications that are difficult to understand make students lose focus. (R1) • easy to understand (R3) • start-up page that introduces all button/logo used and its function (R9)
Multimedia presentation	Media (text, graphics, animation, audio, etc.) and content that use a combination of different presentation forms, including a combination of text, audio, graphics, animation, and video	• nice graphics (R3) • interactive content (R4) • attractive and suitable colours and characters (R4) • choice of colours, appropriate/interesting diagrams (R5) • use bright and cheerful colours in the medium of communication (R6) • the 'Apps' can be soft colour, sans-serif font (R7) • colours that do not tire the eyes quickly (R8) • appropriate font size (R8)
Links to related educational systems	A list of links to related educational platforms or databases	• provide an easily accessible platform for students to find materials (website/ mobile apps specific to the subject) (R10)

The fixed frame design means a list of menu items from which learners can choose any learning contents and functions interface (Chou et al., 2010). The finding shows respondents prefer mobile learning that allow learners to choose any learning contents and functions interface, which are provided with menu, button, text area (R2) and the 'Apps' can be in the form of a book icon (outer icon) and menu bar (inner icon) (R7). Besides that, the sitemap aspect means a list of pages of a Web site accessible to learners (Chou et al., 2010). It is recommended to provide list of accessible Web sites that easy to navigate (R3, R4).

The finding shows ability for student to easily downloaded teaching content (notes) (R1, R2) and upload assignments/tasks (R2) has been recommended for learner- interface interaction. The software downloading/ uploading aspect means learners can freely download/upload materials from the system for a particular learning purpose (Chou et al., 2010).

User guidance for a system aspect means a guidance feature that facilitates system use (Chou et al., 2010). In the context of study, respondents have recommended to provide a "user-friendly" application for students to feel easy to use and understand (R1, R3); and start-up page that introduces all button/logo used and its function (R9)

Multimedia presentation aspect means media and content that use a combination of different presentation forms, including a combination of text, audio, graphics, animation, and video (Chou et al., 2010). The finding shows respondents have recommending multimedia presentation: using sans-serif font (R7); appropriate font size (R8); choice of suitable and cheerful colours (R4, R5, R6, R7, R8); attractive character (R4), appropriate and interesting graphics (R3, R5), and interactive content (R4).

Lastly, links to related educational systems aspect means a list of links to related educational platforms or databases (Chou et al., 2010). In this study, respondent suggested developer to provide an easily accessible platform for students to find materials (website/ mobile apps specific to the subject) (R10)

Conclusion

This study has explored learning preferences for student's interactions in social science research course which are learner-learner, learner-instructor, learner-content, learner-interface and learner-self. Based on analysis and discussion, this study can be concluded that student's roles, instructor's roles, learning tools, learning activities, learning materials, and are important criteria that must be included in development of student's interactions especially among social science researcher in mobile learning environment. Besides interacting with their classmates, students are having role in sharing information based on their understanding, involvement in discussion, asking questions, do self- reflection and working together in group tasks or assignments. On the other hand, the instructor/ monitor/ facilitator plays important role in initiate discussion, they have skill in communication and asking questions to their students, provide questions that trigger their students to think critically, monitoring students learning progression, give motivation, give feedback, and reward their students. When using mobile devices, instructors should not only take into account the capabilities of the devices that are available, but also pay close attention to instructional design to support teaching methods that encourage students to use their devices for appropriate purposes (Sophonhiranrak, 2021). The results of this study also demonstrate that links to related educational systems; links to related learning material; multimedia presentation; and sweepstakes all play a role in the learner-content interaction. While learning dashboard; grade-status tracking; diary and reflective journal; calendar and schedule reminder; task-list; individualized test/quiz; learning-completion tracking; assignment-completion tracking; and examination-status tracking are among the nine aspects that contributed to learner-self interaction in the social science research course. The research also reveals six factors, including multimedia presentation; sitemap; user guidance for a system; fixed frame (menu) design; software downloading/ uploading; and links to related educational systems, that helped learners interact with the interface during the social science research course.

Limitations and Future Studies

Several restrictions or challenges were found while putting this study into practice. The first is the small group of social science researcher involve in this study. Future research recommendation is involving a large group of social science researcher or involving other research field such as science computer, engineering and medical. Second, it is advised to further research of mobile learning in special education to determine whether these tools and settings can help students with impairments. Third, this study only discusses on type of interactions among social science researcher, which is under Interaction Learner intersection (LS). This study suggests future researcher to investigate on situated cognition criteria and learning community criteria, and other mobile learning aspects such as Device aspect (D), Learner aspect (L), Social aspect (S), Device Usability intersection (DL) and Interaction Learner intersection (LS). Fourth, due to a lack of time and the respondents' busy schedules with work, school, and daily responsibilities, it is very challenging to consistently get the attention of the respondents because they were specifically questioned regarding their opinions and previous encounters as social science researcher. Additionally, the respondents must be well-known to the researcher in order to gain their cooperation and feedback because they rarely or never interact well with strangers.

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