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**A UX EVALUATION MODEL OF HEARING-IMPAIRED
CHILDREN'S MOBILE LEARNING APPLICATIONS**

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**DOCTOR OF PHILOSOPHY
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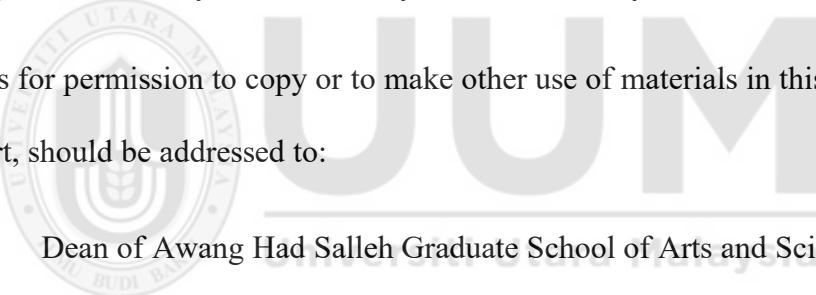
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Abstrak

Beberapa kajian telah dijalankan tentang penilaian pengalaman pengguna (UX) aplikasi mudah alih cacat pendengaran. Namun begitu, kajian-kajian ini tidak tertumpu kepada pengukuran aplikasi pembelajaran mudah alih kanak-kanak cacat pendengaran (KCP). Objektif kajian ini adalah untuk membangunkan model penilaian UX aplikasi pembelajaran mudah alih KCP. Dalam membangunkan model ini, ulasan kajian lepas dan pengumpulan keperluan digunakan untuk menjana satu set dimensi, kriteria, dan metrik UX. Model ini dibangunkan berdasarkan kepada struktur Model *Quality in Use Integrated Measurement* yang mana dimensi, kriteria dan metrik UX yang telah dikenalpasti disusun mengikut peringkat. Model ini telah ditentusahkan oleh pakar yang terdiri daripada ahli akademik, pembangun aplikasi mudah alih dan guru KCP. Pendapat pakar telah dianalisis menggunakan Teknik *Fuzzy Delphi Method*. Tambahan pula, model ini telah disahkan oleh pengamal UX dengan penelitian dibuat terhadap penyampaian model, pengaturan kandungan dan prestasi tugas. Penilaian UX telah dijalankan terhadap 38 orang kanak-kanak cacat pendengaran daripada Sekolah Kebangsaan Pendidikan Khas (SKPK) Johor Bharu, SKPK Perlis, dan Program Pendidikan Khas Integrasi Segamat untuk mengesahkan kebolehpercayaan model ini. Analisa deskriptif dan korelasi antara keseluruhan UX serta dimensi UX di dalam model ini telah dilaksanakan dengan menggunakan kaedah statistik. Kajian ini mencadangkan lima dimensi: kepuasan, kebolehcapaian cacat pendengaran, kecekapan, keberkesanan dan emosi; sembilan kriteria dan 24 metrik. Kriteria dan metrik untuk dimensi tersebut menjadi keperluan memastikan penilaian yang dilakukan itu lebih spesifik dan memfokus kepada aplikasi pembelajaran mudah alih KCP. Oleh itu, sebuah model penilaian UX aplikasi pembelajaran mudah alih KCP telah dikemukakan di dalam kajian ini. Pembangun aplikasi mudah alih dan penyelidik UX boleh menggunakan model ini dalam membangunkan aplikasi pembelajaran mudah alih yang memberikan pengalaman positif dan sesuai digunakan oleh KCP. Asas pembelajaran di kalangan KCP dapat ditambah baik lagi dengan adanya aplikasi pembelajaran mudah alih yang seronok dan mudah digunakan.

Kata Kunci: Model penilaian UX, Aplikasi pembelajaran dalam telefon kanak-kanak cacat pendengaran, Dimensi UX, Kriteria UX, Metrik UX

Abstract

Several studies on User Experience (UX) evaluation of the mobile application for hearing-impaired had been conducted in the past, however, they do not concentrate on measurements related to hearing-impaired children (HIC), especially for mobile learning applications. This study aims to develop a UX evaluation model for HIC's mobile learning applications. In developing the model, paper review and requirement gathering methods were used to generate a set of UX dimensions, criteria, and metrics. The model was constructed based on the structure of the Quality in Use Integrated Measurement model where the identified UX dimensions, criteria, and metrics have been arranged orderly according to their rankings. The model was verified by experts consisting of academicians, mobile application developers, and teachers of HIC. The obtained data were analysed using the Fuzzy Delphi Method. Moreover, UX practitioners have validated the model to measure model presentation, content arrangement, and task performance. In addition, 38 HIC from *Sekolah Kebangsaan Pendidikan Khas* (SKPK) Johor Bharu, SKPK Perlis, and *Program Pendidikan Khas Integrasi Segamat* participated in a series of UX evaluations to validate the model's reliability. Descriptive analysis and correlation between overall UX and UX dimensions were performed through a statistical tool. This study has proposed five dimensions: satisfaction, hearing-impaired accessibility, efficiency, effectiveness, and emotion; with nine criteria, and 24 metrics. Criteria and metrics for the dimensions are needed to make the evaluation more specific and focused on mobile learning applications for HIC. Thus, a UX evaluation model of HIC's mobile learning applications has been presented in this study. Mobile application developers or UX researchers can use this model as one of the references for developing positive experiences and suitable functionalities for HIC's mobile learning applications. Their learning foundation could be strengthened by having usable and enjoyable mobile learning applications.

Keywords: UX evaluation model, Hearing-impaired children mobile learning application, UX dimensions, UX criteria, UX metrics

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List of Abbreviations

ACM	Association of Computer Machinery
ADHD	Attention Deficit Hyperactivity Disorder
AHP	Analytical Hierarchy Process
ASL	American Sign Language
CUE	Component of User Experience
DOSM	Department of Statistics Malaysia
DOSWM	Department of Social Welfare Malaysia
GEQ	Game Experience Questionnaires
GQM	Goal Question Metric
HCI	Human Computer Interaction
IEEE	Institute of Electrical and Electronics Engineers
ISO	International Standard Organization
ITU	International Telecommunication Union
MAEHI	Model for Mobile Application Evaluation for Hearing-Impaired
MAR	Mobile Augmented Reality
MCMC	Malaysian Communications and Multimedia Commission
meCUE	Measuring of User Experience
mGQM	Mobile Goal Question Metric
MOE	Ministry of Education Malaysia
QUIM	Quality In Use Integrated Measurement
QUIS	Questionnaire for User Interaction Satisfaction
SKPK	Sekolah Kebangsaan Pendidikan Khas
TTY	Teletypewriter
UEQ	User Experience Questionnaires
USE	Usefulness, Satisfaction and Ease of Use Questionnaires
UX	User Experience
UX MoLHIC	UX Mobile Learning Hearing Impaired Children
VAS	Visual Analogue Scale
VR	Virtual Reality
W3C	World Wide Web Consortium
WAI	Web Accessibility Initiative
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Background of Study

Recently, the significance of clients' understanding and feelings about specific frameworks and items has moved from conventional usability concentration to the field of user experience (UX). This effect has increased the capacity of UX to gauge the clients' commitment and blissful feelings more than the traditional measure of users' convenience (Kujala et al., 2011). Additionally, users' assumptions and expectations regarding a product influence their encounters with it (Roto et al., 2011).

UX is important to ensure that users continuously use the application positively (Greunen, Merwe, & Kotze, 2010). Vermeeren et al. (2010) defined UX as users' perception of the usability of a product. UX is a subjective quality that measures how users feel about the system (Roto et al., 2009) and focuses on life experiences compared to usability testing, which focuses on task performance (Kaye, 2007). Besides, the interactions before, during, and after using the system make UX valuable (Mashapa & Greunen, 2010). It is important to know how the experience derives over time.

UX is an important part after usability evaluation. Fundamentally, usability evaluation ensures that the application developed meets users' needs. Usability evaluation is applied in assessing efficiency, satisfaction, learnability, memorability, and errors (Nielsen, 1994). In contrast, ISO 9241-11 (2018) stated that UX is used to evaluate perception or

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Appendix A

FUN SORTER FORM

Name:

Age:

Level of fun <i>(Tahap Keseronokan)</i>	Easiest to do <i>(Paling senang guna)</i>
Most fun <i>(Paling seronok)</i>	Easiest <i>(Sangat mudah guna)</i>
Fun <i>(Seronok)</i>	Easy <i>(Mudah guna)</i>
Least Fun <i>(Kurang Seronok)</i>	Difficult <i>(susah guna)</i>

Appendix B



UNIVERSITI UTARA MALAYSIA
AWANG HAD SALLEH GRADUATE SCHOOL OF ARTS AND
SCIENCES, SCHOOL OF COMPUTING

INTERVIEW SESSION

INTERVIEWEE BACKGROUND (TEACHERS)

Nama	
No. K/P:	
Pengalaman Mengajar	
Pengalaman mengajar murid masalah pendengaran (tahun)	

INTERVIEW QUESTION

- 1) Apakah matapelajaran yang diajar di SKPK?

Matapelajaran	Darjah/tahun	Jenis masalah murid (pekak/buta/bisu dan lain2)
1)		
2)		
3)		
4)		
5)		

- 2) Adakah anda mempunyai pengalaman menggunakan aplikasi telefon, *courseware* atau web untuk kanak-kanak masalah pendengaran? Jika Ya,
- Bolehkah anda terangkan secara ringkas berkenaan aplikasi tersebut?

b. Apakah ciri-ciri yang paling anda suka tentang aplikasi tersebut?

c. Apakah benda yang menyebabkan anda *frust* tentang aplikasi tersebut?

- 3) Adakah anda menggunakan sebarang teknologi interaktif semasa proses pembelajaran di dalam kelas? Ya / Tidak
- 4) Jika ya, apakah masalah yang anda hadapi semasa mengajar dalam kelas? Jika tidak, mengapa anda memilih untuk tidak menggunakan teknologi interaktif dalam pengajaran dan pembelajaran?

- 5) Bagaimana penerimaan murid-murid ini terhadap teknologi dalam pembelajaran? Adakah mereka boleh mengikuti perkembangan teknologi atau takut untuk mencuba sesuatu yang baru?

- 6) Pada pendapat anda, sekiranya murid-murid ini diperkenalkan dengan aplikasi telefon, adakah mereka boleh belajar sendiri melalui aplikasi tersebut tanpa pemantauan?

- 7) Apakah yang anda impikan daripada sebuah aplikasi telefon pembelajaran untuk murid-murid masalah pendengaran ini?

- 8) Berikan sebarang cadangan untuk menjadikan aplikasi tersebut menarik untuk digunakan oleh kanak-kanak masalah pendengaran ini.

The logo of Universiti Utara Malaysia (UUM) is a circular emblem. It features a central shield with a traditional Malay pattern, flanked by two stylized figures. The words "UNIVERSITI UTARA MALAYSIA" are written in a circular arc at the top, and "ILMU BUDI BAKTI" is at the bottom. To the right of the logo, the letters "UUM" are displayed in large, bold, sans-serif capital letters. Below "UUM", the university's name is written again in a smaller, lighter font: "Universiti Utara Malaysia".

Appendix C



UNIVERSITI UTARA MALAYSIA
AWANG HAD SALLEH GRADUATE SCHOOL OF ARTS AND
SCIENCES SCHOOL OF COMPUTING

INTERVIEW SESSION

INTERVIEWEE BACKGROUND (PARENTS)

Nama ibu/bapa/waris	
Umur anak	
Bilangan anak yang istimewa	/
Purata pendapatan sebulan	

Masalah kekurangan anak :

- () masalah pendengaran - pekak () masalah penglihatan - buta
 () masalah pertuturan - bisu () masalah pembelajaran – autism/dyslexia/lembam

Jika masalah pendengaran, apakah tahap *hearing loss* anak anda ?

- () moderate () severe () profound

INTERVIEW QUESTION

- 1) Apakah masalah paling nyata yang anda hadapi dalam menguruskan anak masalah pendengaran ini?

- 2) Berapa kerap anak anda tantrum jika kehendaknya tidak dituruti? Apakah tindakan yang anda ambil sekira ianya berlaku?

- 3) Adakah perbezaan tingkah laku antara anak-anak anda yang normal dengan yang istimewa ini? Jika ya, bolehkah anda terangkan secara ringkas berkenaan tingkah laku tersebut?

- 4) Adakah anda melibatkan diri atau anak anda dengan mana-mana pertubuhan atau komuniti masalah pendengaran? Mengapa?

- 5) Adakah anak anda mempunyai masalah lemah dalam pembelajaran jika dibandingkan dengan anak-anak yang lain?

- 6) Adakah anda mempunyai pengalaman menggunakan aplikasi telefon, *courseware* atau web untuk kanak-kanak masalah pendengaran? Jika Ya,

- i. Bolehkah anda terangkan secara ringkas berkenaan aplikasi tersebut?

- ii. Apakah ciri-ciri yang paling anda suka tentang aplikasi tersebut?

iii. Apakah benda yang menyebabkan anda *frust* tentang aplikasi tersebut?

7) Adakah anak anda menggunakan sebarang teknologi interaktif semasa belajar sendiri di rumah?

8) Jika ya, apakah masalah yang anak anda hadapi semasa belajar sendiri? Jika tidak, mengapa anda memilih untuk anak anda tidak menggunakan teknologi interaktif untuk belajar di rumah?

9) Bagaimana penerimaan anak anda terhadap teknologi dalam pembelajaran? Adakah mereka boleh mengikuti perkembangan teknologi atau takut untuk mencuba sesuatu yang baru?

10) Pada pendapat anda, sekiranya anak anda ini diperkenalkan dengan aplikasi telefon, adakah mereka boleh belajar sendiri melalui aplikasi tersebut tanpa pemantauan daripada anda?

- 11) Apakah yang anda impikan daripada sebuah aplikasi telefon pembelajaran untuk anak anda yang masalah pendengaran ini?

- 12) Berikan sebarang cadangan untuk menjadikan aplikasi tersebut menarik untuk digunakan oleh kanak-kanak masalah pendengaran ini.



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Appendix D

Description	Journal/Proceeding/Conference	Authors
Articles related to UX in general	International Journal of Human Computer Studies	Kujala et al. (2017); E. L. C. Law et al. (2014)
	Journal of The Association for Information Science and Technology	Aranyi & Van Schaik (2015; Schaik & Aranyi (2015)
	International Journal of Advanced Research in Computer Science	Narang et al. (2017)
	Cogent Engineering	Zarour & Alharbi (2017)
	Sustainability	Feng & Wei (2019)
	Computers	Dirin & Laine (2018)
	European Scientific Journal	S. Kim (2017)
	Procedia Manufacturing	Alhussayen et al. (2015); Peruzzini, Grandi, & Pellicciari (2017)
	Technology and Investment	Wan, Zhu, & Hou (2013)
	International Journal of Interactive Multimedia and Artificial Intelligence	Rauschenberger et al. (2013)
	International Journal of Computer Science in Sport	Nacke, Lennart. Drachen, Anders. Goebel (2010)
	International Journal of Advanced Research in Computer Engineering & Technology (IJARCET)	Balasubramoniam & Tungatkar (2013)
	(IJACSA) International Journal of Advanced Computer Science and Applications	Andrade et al. (2018)
	Journal of Telecommunication, Electronic and Computer Engineering	Abubakar et al. (2016); Hussain, Isam, & Mkpojiogu (2017); Hussain, Nur, et al. (2017a, 2017b); Yazid & Jantan (2017)
	Interacting with Computers	Hassenzahl et al. (2010); Kujala et al. (2011)
	IEEE Communications Magazine	Ickin et al. (2012)
	International Conference on Multimodal Interaction-ICMI '12	Read (2012)

	13th International Conference on Human-Computer Interaction (INTERACT)	Roto et al. (2011)
	Interact 2009	Roto et al. (2009a)
	The 2nd International Conference on Applied Science and Technology 2017 (ICAST'17)	Hussain, Isam, et al. (2017)
	18th International Conference on User Modeling, Adaptation and Personalization	Hu & Pu (2010); Rong Hu (HCI Group) & Laisanne (2010)
	Proceeding of the twenty-sixth annual CHI conference extended abstracts on Human factors in computing systems - CHI '08	Bernhaupt, Ijsselsteijn, Mueller, Tscheligi, & Wixon (2008)
	Proceedings of the 27th International Conference on Human Factors in Computing Systems	E. L. Law et al. (2009)
	Interacción'2015	González-gonzález & Navarro-Adelantado (2015)
	Interaction Design & Children'13	Sim et al. (2013)
	Proceedings of the International Workshop on Meaningful Measures: Valid Useful User Experience Measurement (VUUM)	Väänänen-vainio-mattila et al. (2008)
	Proceedings of the 12th international conference on Human computer interaction with mobile devices and services - MobileHCI '10	Wäljas, Segerståhl, Väänänen-Vainio-Mattila, & Oinas-Kukkonen (2010)
	Proceedings of the 6th Nordic Conference on Human-Computer Interaction Extending Boundaries - NordiCHI '10	Vermeeren et al. (2010)
	Proceedings of the 20th International Conference of the Association Francophone d'Interaction Homme-Machine on - IHM '08	Hassenzahl (2008)
	The 26th Australian Computer-Human Interaction Conference on Designing Futures: the Future of Design	Walsh, Petrie, & Odutola (2014)
	Proceedings of the 7th Applied Human Factors and Ergonomics Society Conference 2016	Minge et al. (2016)
	Proceedings - NGMAST 2015: The 9th International Conference on Next Generation Mobile Applications, Services and Technologies	Ibrahim et al. (2015)
	Proceedings of the 2010 Annual Research Conference of the South African Institute	Botha et al. (2010); Mashapa & Greunen (2010)

	of Computer Scientists and Information Technologists on - SAICCSIT '10	
Articles related to mobile application	International Journal of Human-Computer Interaction	A. Yeratziotis & Zaphiris (2018)
	International Journal on Advanced Science, Engineering and Information Technology	Kraleva & Kralev (2019)
	International Journal of Computer Applications	Deshmukh et al. (2018)
	International Journal of Mobile and Blended Learning	Shelton & Parlin (2016)
	International Journal of Bio-Science and Bio-Technology	Masitry et al. (2013)
	International Journal of Advanced Computer Science	Malzkuhn & Herzig (2013)
	International Journal of Engineering and Technology(UAE)	Nathan, Berahim, et al. (2018)
	Advanced Journal of Technical and Vocational Education	Samsudin et al. (2018)
	Jurnal Teknologi (Sciences & Engineering)	Dayawati et al. (2016)
	Journal of Engineering and Applied Sciences	Baharuddin, Singh, & Razali (2013); Nathan, Hussain, & Hashim (2018)
Other related articles	Proceedings of the XVI International Conference on Human Computer Interaction - Interacción '15	Cano et al. (2016)
	IST-Africa 2013 Conference Proceedings	G. Yeratziotis & Van Greunen (2013)
Other related articles	ASSETS'09	Mich (2009)
	Knowledge Management International Conference	Ariffin & Faizah (2010); Darus et al. (2012b, 2012a); Kremer, Schlimm, & Lindemann (2017)
	Journal of Applied Sciences, Engineering and Technology	Baharuddin et al. (2013)
Other related articles	Proceedings of HCI KOREA 2015	Park et al. (2014)

Appendix E

Experts' background

	ID	Qualification	Expertise	Years of Experience	Organisation
Academician	Expert 1	Ph.D	Software Development/ User Experience/ Hearing-impaired learning	5-10 Years	Universiti Tun Hussein Onn (Malaysia)UTHM
	Expert 2	Ph.D	User Experience/ User Interface/ E-learning/Mobile Learning	More than 20 Years	Universiti Teknologi Mara (UiTM)
	Expert 3	Ph.D	Software Engineering/ Software Development/ User Experience/ User Interface/ E-Learning/ Mobile Learning/ Edutainment	More than 20 Years	Universiti Putra Malaysia (UPM)
Practitioner	Expert 4	Master	Software Development/ Software Engineering/ User Experience/ User Interface	10-20 Years	Telekom Malaysia
	Expert 5	Degree	Software Development/ User Interface	10-20 years	Telekom Malaysia
	Expert 6	Degree	User Experience/ E-Learning/ Mobile Learning	10-20 years	Telekom Malaysia
	Expert 7	Degree	Software Development/ Information System	10-20 years	Telekom Malaysia
Hearing-impaired	Expert 8	Master	Hearing-impaired learning/ E-Learning/ Edutainment	10-20 years	SK Pendidikan Khas Perlis
	Expert 9	Degree	Hearing-impaired learning	More than 20 years	SK Pendidikan Khas Perlis
	Expert 10	Degree	Hearing-impaired learning/ E-Learning/ Edutainment	10-20 years	SK Pendidikan Khas Perlis

Appendix F

Expert Review Model Verification Email

Dear
Prof/Dr/Sir/Madam,

My name is Normala Mohamad, a Ph.D. research student of Information Technology (IT) specializing in Mobile Human-Computer Interaction (MHCI) at Universiti Utara Malaysia. My intention is to request you on being the nominee for expert review in verifying the new developed model in my research. The developed model attempting for UX evaluation of mobile learning for hearing-impaired (HI) children. The model needs to be reviewed to verify the construction of the model with an appropriate dimension, criteria, and metrics is satisfactory and align with the intention of the proposed model. The developed model is aimed to be a guidance for UX practitioners and mobile learning developers.

Kindly accept my request and review the questionnaire, as well as the model developed with the descriptions as linked to you in guiding this expert review process. All the information will be used only for the purpose of the research and feel free to give any suggestions after the review.

Link of Questionnaire :

https://docs.google.com/forms/d/e/1FAIpQLSevwUAGJKOJWgUdrlbnvD6VQjNjrrWfU6HoOPcDOTv5A6ckZQ/viewform?usp=pp_url

Expert Review Model Verification
Form: A UX evaluation of
hearing-impaired children mobile
learning applications.

docs.google.com

I will be very thankful and flattered if you can accept my request. I hope that I can get the feedback before/on the **25th of October 2020**.

Thousands thanks for your cooperation.
Normala Mohamad
PhD Research Student
normala.mohamad@mara.gov.my
+60196256617

Appendix G

Instruments of Measurement Verification

This section will be verifying the consistency of flow between the selected metrics and criteria in the proposed model. It contains the list of selected UX dimension, criteria and metrics for the UX evaluation of mobile learning for hearing-impaired children. Kindly verify with Likert scale.

Score: 1=Strongly Disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= Strongly Agree

UX Dimensions	Criteria	Metrics	Reference	1	2	3	4	5	Suggestion / Comment
Emotion	Attractiveness								
		Satisfaction with User Interface (UI)	Laugwitz et al., 2008 (UEQ)						
		Feel easy to navigate the application	Minge et al., 2016 (meCUE)						
	Fun								
		Feel happy and knowledgeable with application experience	Minge et al., 2016 (meCUE)						
		Enjoy with layout and presentation of the application	Minge et al., 2016 (meCUE)						
		User excitement to come back with the application	Minge et al., 2016 (meCUE)						
	Efficiency								
		Content							
			Satisfaction with media quality and content	Laugwitz et al., 2008 (UEQ)					
		Clearness of menu/button arrangement	Laugwitz et al., 2008 (UEQ)						

		The content is valuable	Minge et al., 2016 (meCUE)					
Effectiveness	Novelty							
		Novelties of the content	Minge et al., 2016 (meCUE)					
		Innovativeness of the task provided by the application	Laugwitz et al., 2008 (UEQ)					
Effectiveness								
	Consistency							
		Satisfaction with layout presentation	Laugwitz et al., 2008 (UEQ)					
		Easy apps handling	Laugwitz et al., 2008 (UEQ)					
	Aesthetics							
		Satisfaction with color and font use	Nathan, 2017 (MAEHI)					
		The stylish the apps	Minge et al., 2016 (meCUE)					
		The apps creatively design	Laugwitz et al., 2008 (UEQ)					
Satisfaction								
	Intention to use							
		Repetition to use the apps	Minge et al., 2016 (meCUE)					
		Feel easy use the apps daily	Minge et al., 2016 (meCUE)					
	Context to use							
		Suitability of the content for HI children	Laugwitz et al., 2008 (UEQ)					

		Following the syllabus of HI learning	Minge et al., 2016 (meCUE)					
Learnability								
	Readability							
		Understandability of the content	Laugwitz et al., 2008 (UEQ)					
		Easy to learn the content	Laugwitz et al., 2008 (UEQ)					
		Clearness of the content	Laugwitz et al., 2008 (UEQ)					
	Ease of Use							
		Able to perform all tasks given by the learning apps	Nathan, 2017 (MAEHI)					
HI Accessibility								
	Assistive							
		Satisfaction with alerting (vibration/flashin g)	Nathan, 2017 (MAEHI)					
		Satisfaction with usage of alerting in learning apps	Nathan, 2017 (MAEHI)					
		Satisfaction with help video provided	Nathan, 2017 (MAEHI)					
		Satisfaction with a translator for text	Nathan, 2017 (MAEHI)					

Appendix H

Expert Request for Online Meeting



Dear

Prof/Dr/Sir/Madam,

My name is Normala Mohamad, a PhD research student of Information Technology (IT) specializing in Mobile Human Computer Interaction (MHCI) at Universiti Utara Malaysia. My intention is to request you on being the participant as domain expert in UX related and application developers in verifying the newly developed model known as UX evaluation of Mobile Learning Application for Hearing-Impaired Children (UX MoLHIC) model through online meeting due to pandemic Covid-19. The developed UX MoLHIC model attempting for UX of mobile learning applications for hearing-impaired children. UX MoLHIC model need be reviewed to validate on the capability of the model to be used in any UX evaluation for mobile learning applications for hearing-impaired children. UX MoLHIC model is aimed to be guidance for special need people sector especially in evaluating UX of the mobile learning application intended for the hearing-impaired children.

Kindly accept my request for the online meeting and all the information will be discussed further. All the information will be used only for the purpose of the research and feel free to give any suggestions after the review.

Thank you for your time and co-operation.

Normala Mohamad

+60196256617

normala.mohamad@mara.gov.my

PhD Research Student, Universiti Utara Malaysia

Appendix I

Expert Model Validation Form



A UX Evaluation Model of Mobile Learning or Hearing-Impaired Children

EXPERT MODEL VALIDATION FORM

Dear

Prof/Dr/Sir/Madam,

My name is Normala Mohamad, a PhD research student of Information Technology (IT) specializing in Mobile Human Computer Interaction (MHCI) at Universiti Utara Malaysia. Firstly, I would like to thank you for agreeing to be part of this study as an expert to validate the newly developed UX MoLHIC model attempting to construct the UX of hearing impaired children mobile learning applications evaluation.

The main aim of this validation is to examine the applicability of the developed UX MoLHIC model into real world environment for evaluation of mobile learning application for the hearing-impaired children. Moreover, the validation is one of the objectives of my PhD research. The construction of the UX MoLHIC model with appropriate dimension and metrics is in attempt to ensure that the model is satisfactory and aligned with the intention of the targeted users. UX MoLHIC model is aimed to be a guidance for special needs people mobile learning application development sector especially in evaluating UX of the mobile learning application intended for the hearing-impaired children. This paper contains **FOUR (4)** parts; Part A: Expert Profile, Part B: UX MoLHIC Model and blueprint of learning apps, Part C: Assessment Form and Part D: Validation Form described as follow:

- i. **Part A:** Expert Profile- This part contains information of the expert. Kindly fill the form before starting the validation and please enclosed this validation documentation with a copy of curriculum vitae. Please be informed that all the information given is fully confidential and will only be used for research purpose.
- ii. **Part B:** UX MoLHIC Model- This is overview of the developed UX evaluation model of mobile learning for the hearing-impaired children.

This model have been amended through verification process that was conducted through expert review from both academic and industry in application development and UX domain.

- iii. **Part C:** Assessment Form- This form is meant for detailed out on the data to be collected during real world UX evaluation to be conducted for hearing-impaired mobile learning application evaluation. This form consists of participant details and subjective data to be collected. In this form, data collection method for metrics as shown in the developed model was also provided as reference for experts.
- iv. **Part D:** Validation Form- This form consists expert view on issues that validate the usefulness of the UX MoLHIC model in UX of mobile learning application for hearing-impaired children. Comments and suggestion are welcomed in this part to ensure applicability of the model in real world environment.

Experts are expected to comment on the data collection method through the assessment form and finally evaluate the UX MoLHIC model through the validation form provided in this documentation.

All the information will be used only for the purpose of the research and feel free to give suggestions after the review.

Thank you for your time and co-operation. Please be free to contact me for further information.

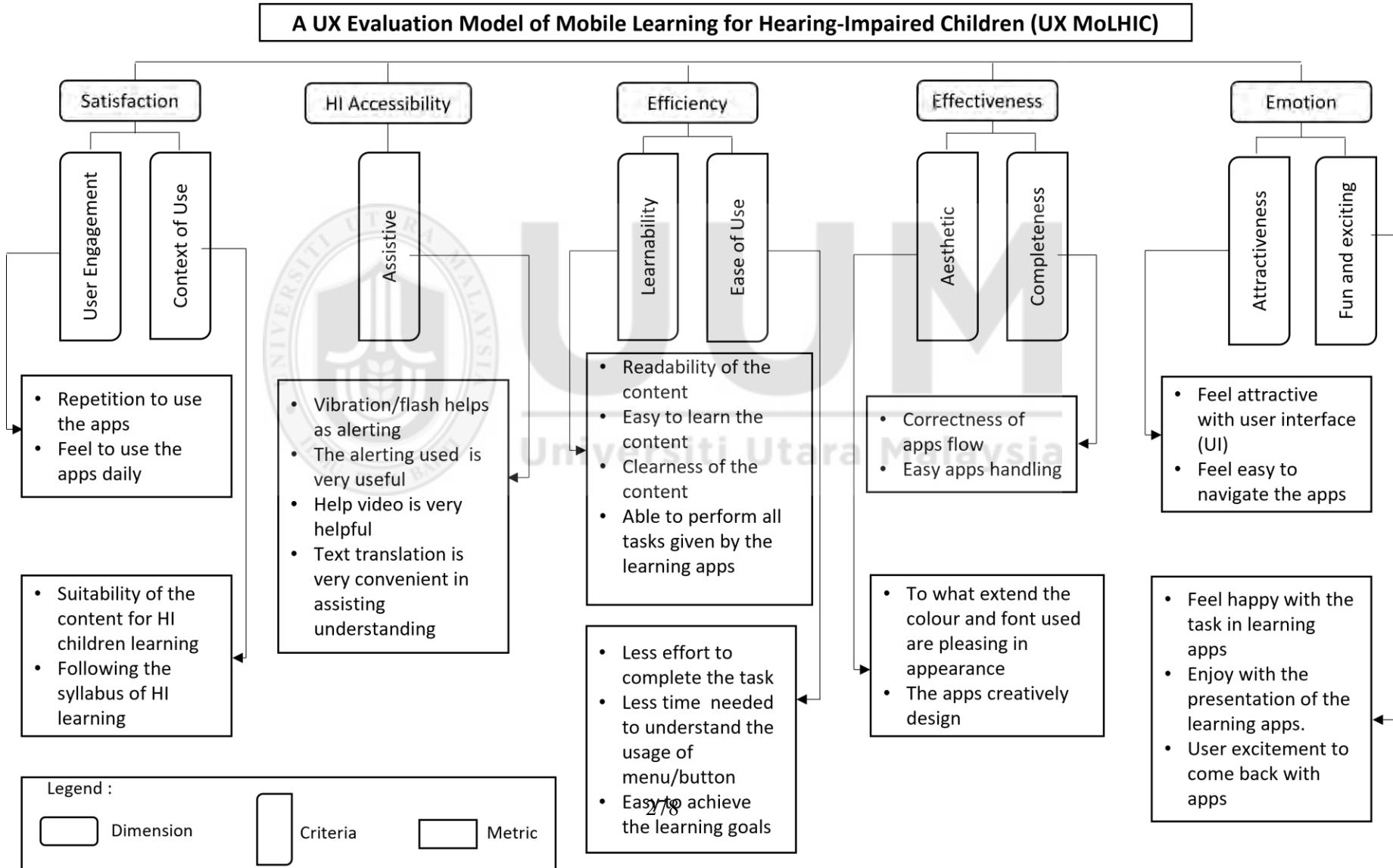
Normala Mohamad
+60196256617
normala.mohamad@mara.gov.my
PhD Research Student, Universiti Utara Malaysia

PART A: EXPERT PROFILE

Expert Name	
Mobile Phone*	
Affiliation*	
Company Name	
Gender	(<input type="checkbox"/>) Male (<input type="checkbox"/>) Female
Year of Experience in UX Domain	

*Optional

PART B: UX MoLHIC Model



PART C: Evaluation for Measurement

This measurement evaluation is to obtain data on UX on the mobile learning application used. However, please be noted that this form is only for validation purpose that summarize all the variable that will be accessed from hearing-impaired children. Real time collection for task will be done in separate form which have direct UX view according to the learning application being used and task conducted by the hearing-impaired children.

Note: In marking the left or right options you are not necessarily indicating *strong* agreement or disagreement but just your general feeling most of the time. Please **TICK** on the numbers which most appropriately reflect your satisfactions about using this learning application.

Score: 1=Strongly Disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= Strongly Agree

UX Dimension	Criteria	Metrics	Score					
			1	2	3	4	5	6
Satisfaction	User engagement	Repetition to use the apps						
		Feel to use the apps daily						
	Context of use	Suitability of the content for HI children learning						
		Following the syllabus of HI learning						
HI Accessibility	Assisstive	Vibration/flash helps as alerting						
		The alerting used is very useful						
		Help video is very helpful						
		Text translation is very convenient in assisting understanding						
Efficiency	Learnability	Readability of the content						
		Easy to learn the content						
		Clearness of the content						

		Able to perform all tasks given by the learning apps						
Effectiveness	Ease of Use	Less effort to complete the task						
		Less time needed to understand the usage of menu/button						
		Easy to achieve the learning goals						
Emotion	Aesthetics	Correctness of apps flow						
		Easy apps handling						
	Completeness	To what extend the colour and font used are pleasing in appearance						
Attractiveness	Attractiveness	The apps creatively design						
		Feel attractive with user interface (UI)						
		Feel easy to navigate the apps						
Fun & Exciting	Fun & Exciting	Feel happy and knowledgeable with apps experience						
		Enjoy with the layout presentation of the learning apps.						
		User excitement to come back with apps						

PART D: Validation Form

Please validate and give comments on the below mentioned issues on the developed UX evaluation model of mobile learning application for hearing-impaired children (UX MoLHIC) implementation.

ISSUES	DESCRIPTIONS	COMMENTS/SUGGESTIONS
Practicality	The proposed model is practical to be implemented in the real-world development environment of mobile learning application for hearing-impaired children.	Agree <input type="checkbox"/> Disagree <input type="checkbox"/> Comments/Suggestions: ----- -----
Completeness	The proposed model is adequate and suitable for evaluating the UX of hearing-impaired mobile learning application.	Agree <input type="checkbox"/> Disagree <input type="checkbox"/> Comments/Suggestions: ----- -----
Relevancy to the intended application	The criteria and metrics in the proposed model are applicable for hearing-impaired mobile learning applications.	Agree <input type="checkbox"/> Disagree <input type="checkbox"/> Comments/Suggestions: ----- -----
Perceived Usefulness	The proposed model is useful for the mobile learning application developers, UX practitioners and especially HI application.	Agree <input type="checkbox"/> Disagree <input type="checkbox"/> Comments/Suggestions: ----- -----
Understandability	The proposed model is understandable and readable.	Agree <input type="checkbox"/> Disagree <input type="checkbox"/> Comments/Suggestions: ----- -----
Clarity	The evaluation criteria and the flow of assessment process is clear for the model provided.	Agree <input type="checkbox"/> Disagree <input type="checkbox"/> Comments/Suggestions: ----- -----
Ease of use	The proposed model can be implemented easily on evaluating UX of mobile	Agree <input type="checkbox"/> Disagree <input type="checkbox"/> Comments/Suggestions:

	learning application for hearing-impaired children.	----- -----
Organisation	The proposed model is organized and structured well as per the need of UX evaluation.	Agree <input type="checkbox"/> Disagree <input type="checkbox"/> Comments/Suggestions: ----- -----
Ability to produce expected result	The proposed model enables to identify UX problems of mobile learning application for hearing-impaired children and ensure usefulness of the application for the user and enable to use for future improvements of the hearing-impaired children mobile learning applications.	Agree <input type="checkbox"/> Disagree <input type="checkbox"/> Comments/Suggestions: ----- -----

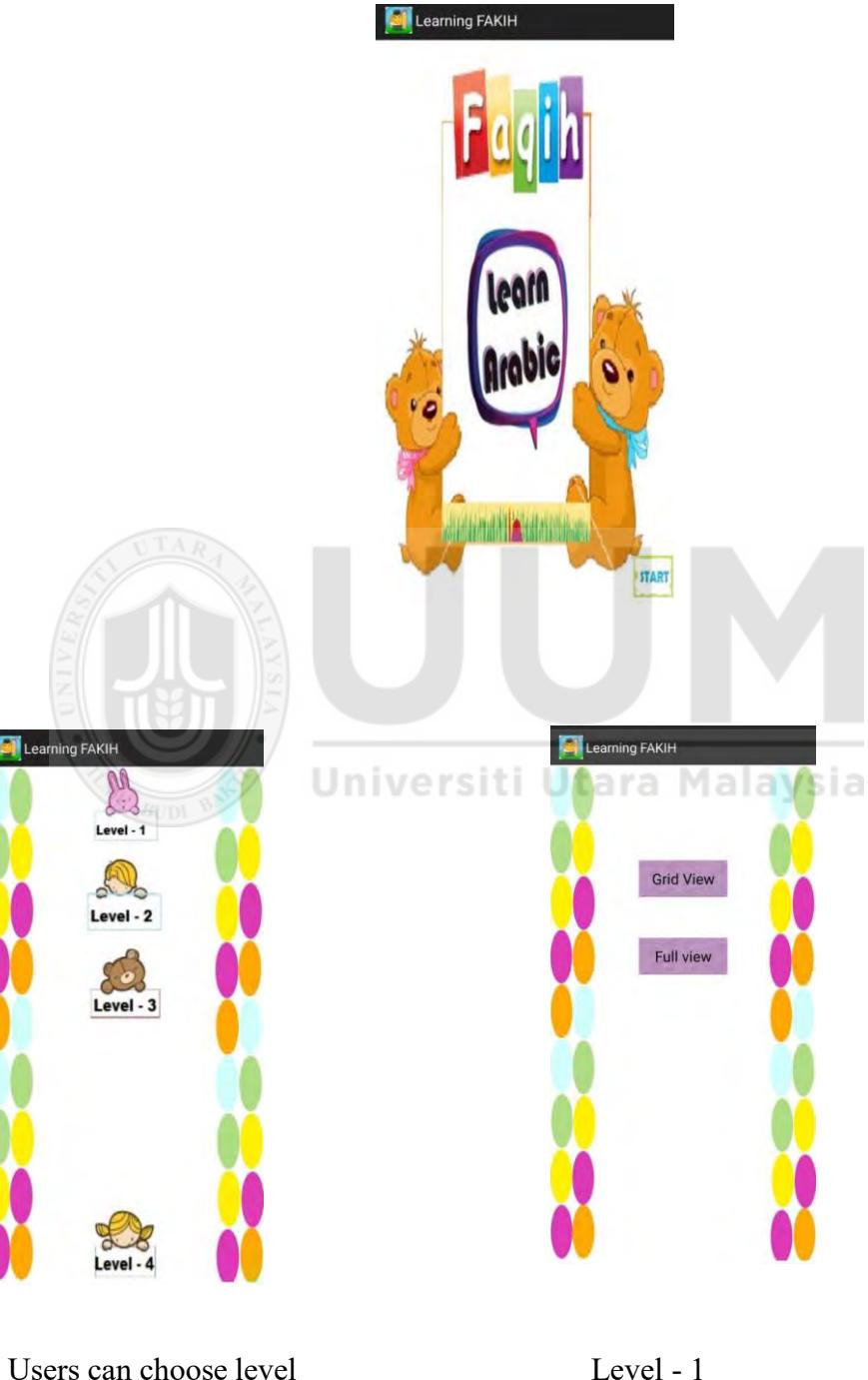
Overall Comments/Suggestion

Thank you for participating.

Appendix J

A Blueprint as a reference for expert validation

Blueprint of Learning Fakih





Grid view

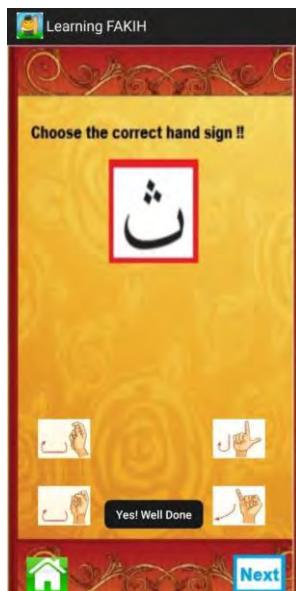


Full View



Users able to choose level of quiz

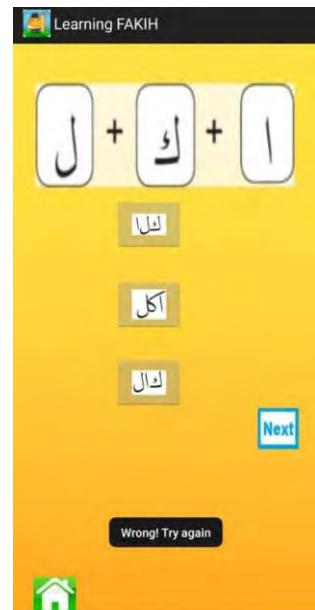
Level EASY



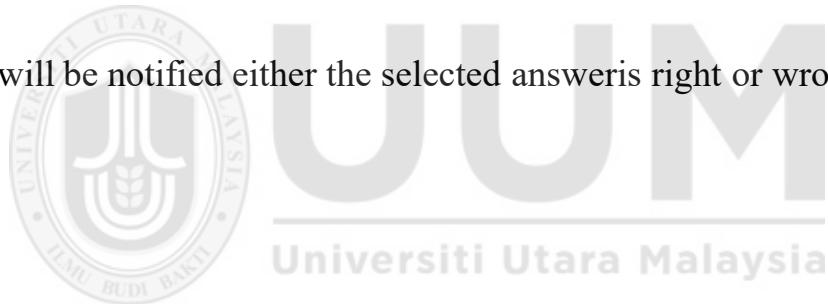
Users will be notified either the selected answer is right or wrong

Level Medium

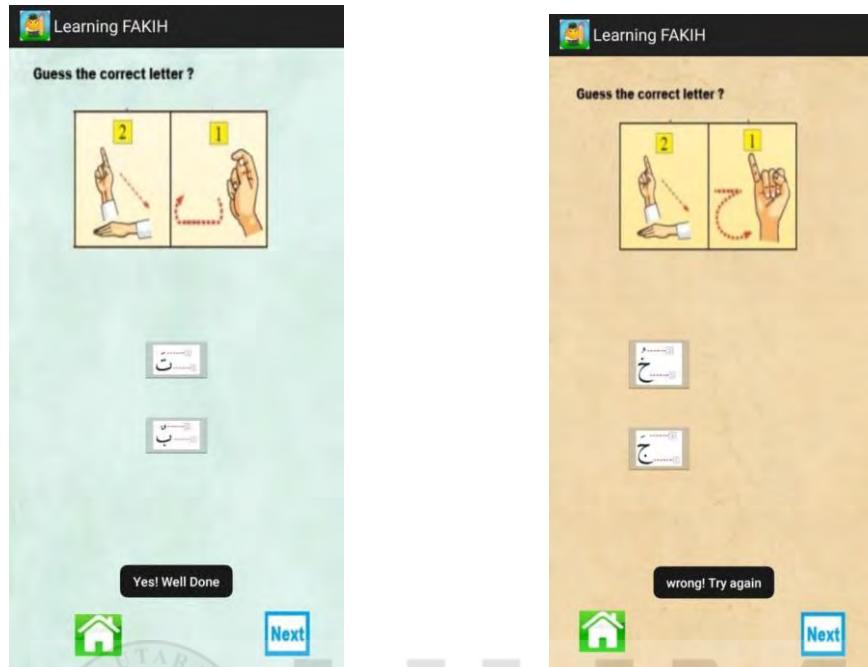




Users will be notified either the selected answer is right or wrong



Level HARD



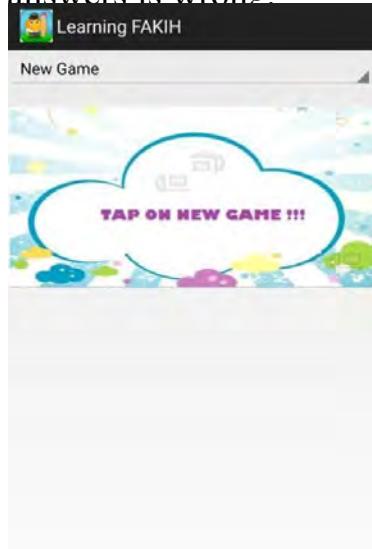
Users will be notified either the selected answer is right or wrong

Level - 287

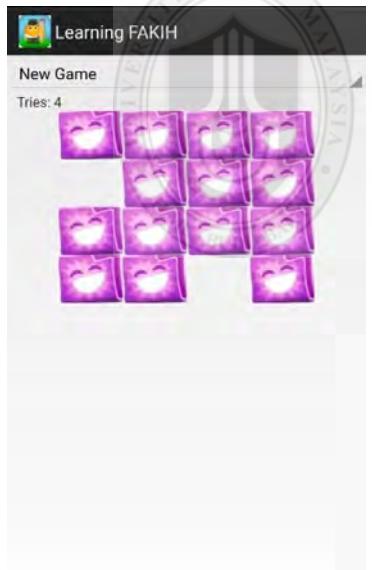


Users are required to touch the colored circle based on arrangement of ‘huruf hijahiyyah’ and ‘baris’ orderly but the number will not be appeared if the

answers is wrong.



Users able to play simple games



Appendix K

Blueprint of KoTBAM



Users able to choose from Menu Utama



Kod Tangan Bahasa Melayu



- There are many options in Menu Kod tangan BahasaMelayu.
- All the options are provided with videos of sign language based on the title.
- Users able to choose from the options given.



Huruf



Warna



Nombor



Hari dan Bulan



Haiwan

Bina Ayat



- There are two options in BINA AYAT which are SITUASI 1 and SITUASI 2.
- All the options are provided with videos of sign language based on the title.
- Users able to choose from the options given.

Bina Ayat



Situasi 1 (Kenali Diri)



Situasi 2 (Kenali Diri)

Appendix L

Adapted Question from UEQ/meCUE/MAEHI

Items	Adapted from
<i>Aplikasi ini membuatkan saya rasa gembira selepas menggunakanannya.</i>	meCUE
<i>Aplikasi ini mudah dilayari</i>	UEQ
<i>Kandungan aplikasi ini mudah difahami</i>	UEQ
<i>Semua tugas dalam aplikasi ini dapat diselesaikan</i>	MAEHI
<i>Saya faham apa yang dipelajari dengan menggunakan aplikasi ini</i>	meCUE
<i>Aplikasi ini akan digunakan lagi pada masa akan datang</i>	meCUE
<i>Notifikasi yang digunakan oleh aplikasi ini amat membantu saya</i>	MAEHI
<i>Persembahan aplikasi ini membuatkan saya seronok menggunakanannya.</i>	UEQ
<i>Aplikasi ini mudah digunakan</i>	UEQ
<i>Butang menu yang digunakan dalam aplikasi ini cepat difahami</i>	
<i>Rekabentuk aplikasi ini dibangunkan secara kreatif</i>	UEQ
<i>Kandungan aplikasi ini mudah untuk dipelajari</i>	UEQ
<i>Semua tugas dalam aplikasi ini boleh diselesaikan dengan mudah</i>	meCUE
<i>Kandungan dalam aplikasi ini diterangkan dengan jelas</i>	meCUE
<i>Help video yang digunakan dalam aplikasi ini amat membantu</i>	MAEHI
<i>Aplikasi ini membuatkan saya berasa teruja untuk menggunakaninya lagi</i>	meCUE
<i>Kandungan pembelajaran dalam aplikasi ini sangat sesuai untuk saya</i>	UEQ
<i>Terjemahan teks daripada bahasa isyarat sangat membantu saya untuk lebih faham</i>	MAEHI
<i>Semua butang menu yang disediakan berfungsi dengan baik</i>	UEQ
<i>Antara muka aplikasi ini sangat menarik</i>	UEQ
<i>Warna dan fon yang digunakan sangat menenangkan</i>	MAEHI
<i>Aplikasi ini akan digunakan setiap hari</i>	meCUE
<i>Kandungan pembelajarannya sama seperti yang dipelajari di sekolah</i>	meCUE
<i>Vibrate dan flash yang digunakan sebagai tanda peringatan dalam aplikasi ini amat membantu saya</i>	MAEHI

Appendix M

(Reference for teachers)

Borang Pengesahan UX MoLHIC Model

Nama :

Kelas :

Sekolah :

Aplikasi : KoTBAM Learning Fakih

Tandakan (/) di ruangan skor yang dipilih:

Skor: ☹=Lemah, ☻=Kurang baik, ☺=Baik, ☢=Amat baik, ☤=Hebat

Metrik	Skor				
	☹	✻	☺	☢	☽
<i>Aplikasi ini membuatkan saya rasa gembira selepas menggunakaninya.</i> Feel happy with apps experience					
<i>Aplikasi ini mudah dilayari</i> Feel easy to navigate the apps					
<i>Kandungan aplikasi ini mudah difahami</i> Readability of the content					
<i>Semua tugas dalam aplikasi ini dapat diselesaikan</i> Able to perform all tasks given by the apps					
<i>Dengan aplikasi ini, matlamat pembelajaran mudah dicapai</i> Easy to achieve the learning goals					
<i>Aplikasi ini akan diulang penggunaannya</i> Repetition to use the apps					
<i>Notifikasi dalam aplikasi ini amat membantu saya</i> The alerting used is very useful					
<i>Persembahan aplikasi ini menyeronokkan</i> Enjoy with the presentation of the learning apps					
<i>Aplikasi ini mudah digunakan</i> Easy apps handling					
<i>Butang menu yang digunakan dalam aplikasi ini cepat difahami</i> Less time needed to understand the usage of menu/button					

<i>Rekabentuk aplikasi ini dibangunkan secara kreatif</i> The apps creatively designed					
<i>Kandungan aplikasi ini mudah untuk dipelajari</i> Easy to learn the content					
<i>Semua tugas dalam aplikasi ini boleh diselesaikan dengan mudah</i> Less effort to complete the task					
<i>Kandungan dalam aplikasi ini diterangkan dengan jelas</i> Clearness of the content					
<i>Help video dalam aplikasi ini amat membantu</i> Help video is very helpful					
<i>Aplikasi ini membuatkan saya berasa teruja untuk menggunakan lagi</i> User excitement to come back with apps					
<i>Kandungan pembelajaran dalam aplikasi ini sangat sesuai untuk saya</i> Suitability of the content for hearing-impaired children learning					
<i>Terjemahan teks daripada bahasa isyarat sangat sesuai dalam membantu saya untuk lebih faham</i> Text translation is very convenient in assisting understanding					
<i>Semua butang menu yang disediakan berfungsi dengan baik</i> Correctness of apps flow					
<i>Antara muka aplikasi ini sangat menarik</i> Feel attractive with user interface (UI)					
<i>Warna dan fon yang digunakan sangat menyenangkan</i> To what extend the colour and font used are pleasing in appearance					
<i>Aplikasi ini akan digunakan setiap hari</i> Feel to use the apps daily					
<i>Kandungan pembelajarannya sama seperti yang dipelajari di sekolah</i> Following the syllabus of HI learning					
<i>Fungsi Vibrate dan flash dalam aplikasi ini amat membantu saya</i> <i>Vibration/flash helps as alerting</i>					
<i>Bagaimana pengalaman anda semasa menggunakan aplikasi ini secara keseluruhannya</i> <i>How do you experience the product as a whole?</i>					

Appendix N

(Questionnaires for hearing -impaired children)

Borang Pengesahan UX MoLHIC Model

Nama :

Kelas :

Sekolah :

Aplikasi : KoTBAM Learning Fakih

Tandakan (/) di ruangan skor yang dipilih:

Skor: ☹=Lemah, ☻=Kurang baik, ☺=Baik, ☢=Amat baik, ☤=Hebat

Metrik	Skor				
	☹	☻	☺	☢	☽
Aplikasi ini membuatkan saya rasa gembira selepas menggunakaninya.					
Aplikasi ini mudah dilayari					
Kandungan aplikasi ini mudah difahami					
Semua tugas dalam aplikasi ini dapat diselesaikan					
Saya faham apa yang dipelajari dengan menggunakan aplikasi ini					
Aplikasi ini akan digunakan lagi pada masa akan datang					
Notifikasi yang digunakan oleh aplikasi ini amat membantu saya					
Persembahan aplikasi ini membuatkan saya seronok menggunakaninya.					
Aplikasi ini mudah digunakan					
Butang menu yang digunakan dalam aplikasi ini cepat difahami					
Rekabentuk aplikasi ini dibangunkan secara kreatif					
Kandungan aplikasi ini mudah untuk dipelajari					
Semua tugas dalam aplikasi ini boleh diselesaikan dengan mudah					
Kandungan dalam aplikasi ini diterangkan dengan jelas					
<i>Help video</i> yang digunakan dalam aplikasi ini amat membantu					
Aplikasi ini membuatkan saya berasa teruja untuk menggunakan lagi					

Kandungan pembelajaran dalam aplikasi ini sangat sesuai untuk saya					
Terjemahan teks daripada bahasa isyarat sangat membantu saya untuk lebih faham					
Semua butang menu yang disediakan berfungsi dengan baik					
Antara muka aplikasi ini sangat menarik					
Warna dan fon yang digunakan sangat menenangkan					
Aplikasi ini akan digunakan setiap hari					
Kandungan pembelajarannya sama seperti yang dipelajari di sekolah					
<i>Vibrate</i> dan <i>flash</i> yang digunakan sebagai tanda peringatan dalam aplikasi ini amat membantu saya					
Bagaimana pengalaman anda semasa menggunakan aplikasi ini secara keseluruhannya					



Appendix O

Approval Letter by Ministry of Education



KEMENTERIAN PENDIDIKAN MALAYSIA
BAHAGIAN PERANCANGAN DAN PENYELIDIKAN DASAR PENDIDIKAN
ARAS 14, BLOK E8
KOMPLEKS KERJAAN PARCEL E
PUSAT PENTADBIRAN KERAJANAN PERSEKUTUAN
62604 PUTRAJAYA

TEL: 0388846591
FAKS: 0388846579

Ruj. Kami : KPM.600-3/2/3-eras(5189)
Tarikh : 26 September 2019

NORMALA BINTI MOHAMAD
NO. KP : 840423015880

INSTITUT KEMAHIRAN MARA BESERI, KM 14, JLN KAKI BUKIT
BESERI 2400 KANGAR
PERLIS

Tuan,

**KELULUSAN BERSYARAT UNTUK MENJALANKAN KAJIAN :
USER EXPERIENCE MODEL**

Perkara di atas adalah dirujuk.

2. Sukacita dimaklumkan bahawa permohonan tuan untuk menjalankan kajian seperti di bawah telah diluluskan dengan syarat :

" PENYELIDIK MESTI MENDAPATKAN KEBENARAN BERTULIS DARIPADA IBU BAPA/PENJAGA MURID YANG DILIBATKAN DALAM KAJIAN INI. PEMERHARIAN SERTA RAKAMAN VIDEO AKTIVITI PENGAJARAN DAN PEMBELAJARAN MURID DI DALAM BILIK DARJAH TIDAK DIBENARKAN. "
3. Kelulusan adalah berdasarkan kepada kertas cadangan penyelidikan dan instrumen kajian yang dikemukakan oleh tuan kepada bahagian ini. Walau bagaimanapun kelulusan ini bergantung kepada kebenaran Jabatan Pendidikan Negeri dan Pengetua / Guru Besar yang berkenaan.
4. Surat kelulusan ini sah digunakan bermula dari **7 Oktober 2019** hingga **10 Januari 20**
5. Tuan dikehendaki menyerahkan senaskah laporan akhir kajian dalam bentuk *hardcopy* bersama *salinan softcopy* berformat pdf dalam CD kepada Bahagian ini. Tuan juga diingatkan supaya mendapat kebenaran terlebih dahulu daripada Bahagian ini sekiranya sebahagian atau sepenuhnya dapatkan kajian tersebut hendak diterbitkan di mana-mana forum, seminar atau diumumkan kepada media massa.

Sekian untuk makluman dan tindakan tuan selanjutnya. Terima kasih.

"BERKHIDMAT UNTUK NEGARA"

Saya yang menjalankan amanah,

Ketua Sektor
Sektor Penyelidikan dan Penilaian
b.p. Pengarah
Bahagian Perancangan dan Penyelidikan Dasar Pendidikan
Kementerian Pendidikan Malaysia

salinan kepada:-

JABATAN PENDIDIKAN KEDAH
JABATAN PENDIDIKAN PERLIS

* SURAT INI DIJANA OLEH KOMPUTER DAN TIADA TANDATANGAN DIPERLUKAN *



KEMENTERIAN PENDIDIKAN MALAYSIA
BAHAGIAN PERANCANGAN DAN PENYELIDIKAN DASAR PENDIDIKAN
ARAS 1-4, BLOK E8
KOMPLEKS KERJAAN PARCEL E
PUSAT PENTADBIRAN KERJAAN PERSEKUTUAN
62604 PUTRAJAYA

TEL : 0388846591
FAKS : 0388846579

Ruj. Kami : KPM.600-3/23-eras(9352)
Tarikh : 23 Februari 2021

CIK FAZILAH BINTI HIBADULLAH
NO. KP : 770604036444

PUSAT PENGAJIAN PENGKOMPUTERAN, KOLEJ SASTERA DAN SAINS UNIVERSITI
UTARA MALAYSIA 6010 CHANGLOON
KEDAH

Tuan,

KELULUSAN BERSYARAT UNTUK MENJALANKAN KAJIAN :
USER EXPERIENCE (UX) EVALUATION MODEL OF MOBILE LEARNING APPLICATIONS FOR HEARING-IMPAIRED CHILDREN

Perkara di atas adalah dirujuk.

2. Sukacita dimaklumkan bahawa permohonan tuan untuk menjalankan kajian seperti di bawah telah diluluskan dengan syarat :

" KELULUSAN INI BERGANTUNG KEPADA PERTIMBANGAN PENTADBIR SEKOLAH. PENYELIDIK MESTI MENDAPATKAN KEBENARAN BERTULIS DARIPADA IBU BAPA /PENJAGA MURID YANG DILIBATKAN DALAM KAJIANINI. PENGLIBATAN, PEMERHATIAN SERTA RAKAMAN VIDEO TERHADAP AKTIVITI PENGAJARAN DAN PEMBELAJARAN MURID DI DALAM BILIK DARJAH TIDAK DIBENARKAN. "

3. Kelulusan adalah berdasarkan kepada kertas cadangan penyelidikan dan instrumen kajian yang dikemukakan oleh tuan kepada bahagian ini. Walau bagaimanapun kelulusan ini bergantung kepada kebenaran Jabatan Pendidikan Negeri dan Pengetua / Guru Besar yang berkenaan.

4. Surat kelulusan ini sah digunakan bermula dari 1 Mac 2021 hingga 27 Ogos 2021

5. Tuan dikehendaki menyerahkan senaskhah laporan akhir kajian dalam bentuk *hardcopy* bersama salinan *softcopy* berformat pdf dalam CD kepada Bahagian ini. Tuan juga diingatkan supaya mendapat kebenaran terlebih dahulu daripada Bahagian ini sekiranya sebahagian atau sepenuhnya dapatkan kajian tersebut hendak diterbitkan di mana-mana forum, seminar atau diumumkan kepada media massa.

Sekian untuk makluman dan tindakan tuan selanjutnya. Terima kasih.

"BERKHIDMAT UNTUK NEGARA"

Saya yang menjalankan amanah,

Ketua Penolong Pengarah Kanan
Sektor Penyelidikan dan Penilaian Dasar
b.p. Pengarah
Bahagian Perancangan dan Penyelidikan Dasar Pendidikan
Kementerian Pendidikan Malaysia

salinan kepada:-

JABATAN PENDIDIKAN JOHOR
JABATAN PENDIDIKAN KEDAH
JABATAN PENDIDIKAN PERLIS

* SURAT INI DIJANA OLEH KOMPUTER DAN TIADA TANDATANGAN DIPERLUKAN*



KEMENTERIAN PENDIDIKAN MALAYSIA
BAHAGIAN PENDIDIKAN KHAS
ARAS 2, BLOK E2,
KOMPLEKS KERAJAAN PARCEL E
PUSAT PENTADBIRAN KERAJAAN PERSEKUTUAN
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Ruj. Kami : KPM.600-2/1/4 Jld.3 (72)
Tarikh : 26 Mac 2021

Cik Fazilah binti Hibadullah
Pensyarah
Pusat Pengajian Pengkomputeran
Universiti Utara Malaysia
06010 UUM Sintok
KEDAH DARUL AMAN

Puan,

**KELULUSAN BERSYARAT UNTUK MENJALANKAN PENYELIDIKAN
DI SEKOLAH PENDIDIKAN KHAS**

Dengan hormatnya perkara di atas dan surat kelulusan daripada Bahagian Perancangan dan Penyelidikan Dasar Pendidikan [Rujukan:KPM.600-3/2/3-eras(9352)] bertarikh 23 Februari 2021 adalah dirujuk.

2. Sukacita dimaklumkan bahawa Bahagian Pendidikan Khas (BPKhas), Kementerian Pendidikan Malaysia (KPM) tiada halangan untuk membenarkan puan menjalankan kajian bertajuk **“User Experience (UX) Evaluation Model of Mobile Learning Applications for Hearing-Impaired Children”**.

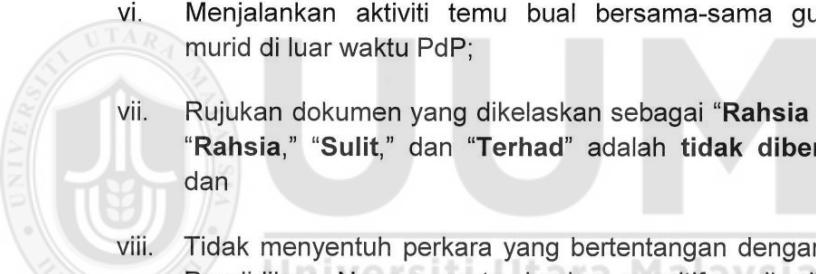
3. Walau bagaimanapun, BPKhas, KPM ingin mengingatkan puan bahawa:

- i. Kelulusan ini tertakluk kepada klausa 4.1.14 Garis Panduan Pengurusan dan Pengoperasian Sekolah Dalam Norma Baru 2.0 yang menyatakan bahawa:

“Tiada pihak luar yang bukan warga KPM termasuk orang kenamaan tidak dibenarkan memasuki kawasan sekolah kecuali bagi tujuan pengoperasian sekolah”

...2/-

"KECEMERLANGAN INSAN ISTIMEWA, KEGEMILANGAN BERSAMA"

- 
- ii. Penglibatan dan pemerhatian terhadap aktiviti pengajaran dan pembelajaran (PdP) di dalam bilik darjah adalah tidak dibenarkan;
 - iii. Tiada sebarang aktiviti rakaman video dan/atau audio aktiviti PdP murid di dalam bilik darjah dan di sekitar kawasan sekolah;
 - iv. Tidak melibatkan murid-murid dari kelas yang menduduki peperiksaan dalam program yang dijalankan;
 - v. Penyertaan murid dan guru dalam kajian adalah secara sukarela;
 - vi. Menjalankan aktiviti temu bual bersama-sama guru dan murid di luar waktu PdP;
 - vii. Rujukan dokumen yang dikelaskan sebagai "**Rahsia Besar**," "**Rahsia**," "**Sulit**," dan "**Terhad**" adalah **tidak dibenarkan**; dan
 - viii. Tidak menyentuh perkara yang bertentangan dengan Dasar Pendidikan Negara serta isu-isu sensitif peribadi murid berkeperluan khas dan keluarga mereka.
4. Surat kelulusan ini sah digunakan bermula dari **tarikh surat ini dikeluarkan hingga 27 Ogos 2021**. Walau bagaimanapun, kelulusan ini adalah bergantung kepada kebenaran Guru Besar dan ibu bapa/penjaga murid yang berkenaan.

KPM.600-2/1/4 Jld.3 (72)

5. BPKhas juga berharap agar puan dapat mengemukakan senaskah laporan akhir kajian berkenaan setelah kajian tersebut disiapkan untuk rujukan dan simpanan Bahagian ini.

Sekian, terima kasih.

"PRIHATIN RAKYAT: DARURAT MEMERANGI COVID-19"

"BERKHIDMAT UNTUK NEGARA"

Saya yang menjalankan amanah,



(HAJAH SALMAH BINTI JOPRI)

Pengarah
Bahagian Pendidikan Khas
b.p. Ketua Setiausaha
Kementerian Pendidikan Malaysia

PC/Masitah/Desktop/Dr.Rozaniza/suratkelulusankajianUXMobileLearning

s.k:

Universiti Utara Malaysia

1. Guru Besar
Sekolah Kebangsaan Pendidikan Khas Sungai Petani
2. Guru Besar
Sekolah Kebangsaan Pendidikan Khas Perlis
3. Guru Besar
Sekolah Kebangsaan Pendidikan Khas Johor Bharu

Appendix P

Guidelines for use of UX MoLHIC Model

The proposed UX MoLHIC model is a dynamic model where the evaluators can adapt the model for any mobile learning application developed for the hearing-impaired children. Proposed UX MoLHIC model may also be used to collect metrics data through survey method conducted with users. Metrics can be applied at the same time as well and comparison are also able to be done using this model.

Besides that, the proposed UX MoLHIC model have the ability to drop any metrics to meet suitability of the evaluation to be conducted. This is because, not all the metrics may be able to fit in any learning application. Some of the metric that can be dropped are such as; vibration/flash helps as alerting, suitability of the content for HI children learning, and following the syllabus of HI learning. These metrics might be improper for some learning application which does not cater such features thus it can be dropped for testing. Different type of application may need different metrics to be tested thus this can be done freely in this model. The model also capable to evaluate any range of mobile devices. This UX MoLHIC model has been verified with minor changes as per discussed in Section 4.7.1 by the expert from both academician and industrialist. The proposed UX MoLHIC model are found to be acceptable and capable in obtaining data through implementation in real world environment. However, to be more precise the model was validated with UX practitioner and developers as well as actual hearing-impaired children and provide applicable result which ensure its validity to perform as acceptable model to be used for hearing-impaired children mobile learning application evaluation.

Appendix Q

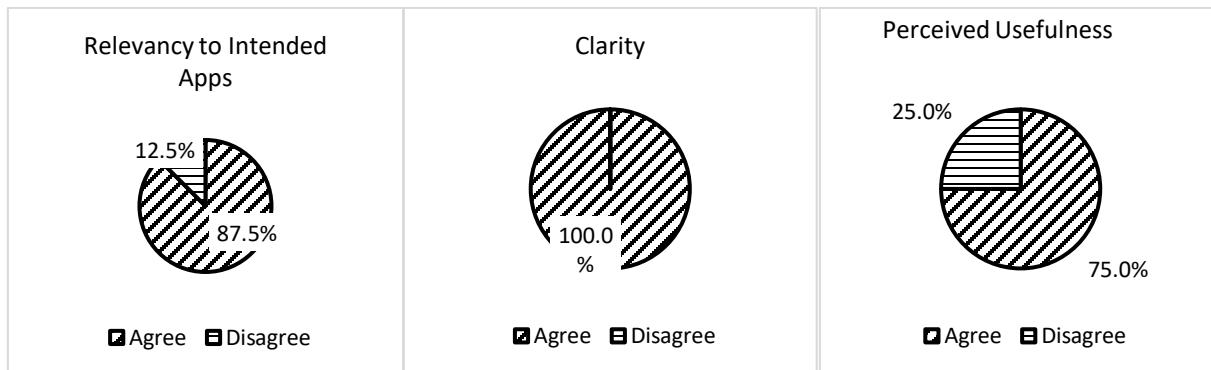
Result for Evaluation of Measurement

Learning Fakih					Item	KoTBAM				
SD	D	N	A	SA		SD	D	N	A	SA
		1	6	1	Satisfaction	Repetition to use the apps	1	2	2	3
		1	6	1		Feel to use the apps daily	2		3	3
		1	6	1		Suitability of the content for HI children learning			4	4
		1	6	1		Following the syllabus of HI learning			4	4
		1	6	1		Vibration/flash helps as alerting			4	4
		1	6	1		The alerting used is very useful			3	5
		1	6	1		Help video is very helpful			3	5
		1	6	1		Text translation is very convenient in assisting in understanding			4	4
		1	6	1		Less effort to complete the task	1	1	2	4
		1	6	1		Less time is needed to understand the usage of menu/button			3	5
		1	6	1	Efficiency	Easy to achieve the learning goals			3	5
		1	6	1		Readability of the content			4	4
		1	6	1		Easy to learn the content			3	5
		1	6	1		Clearness of the content			3	5
		1	6	1		Able to perform all tasks given by the learning apps			3	5
		1	6	1		Correctness of apps flow			4	4
		1	6	1		Easy apps handling			3	5
		1	6	1	Effectiveness	To what extent the colour and font used are pleasing in appearance	1	3	4	
		1	6	1		The apps creatively design			4	4
		2	6			Feel happy with the task in learning apps			3	5
		1	7			Enjoy the presentation of the learning apps.			3	5
		1	7			User excitement to come back with apps	1	2	5	
		1	7		Emotion	Feel attractive with the user interface (UI)	1	2	5	
		7	1			Feel easy to navigate the apps	1	2	5	
		24	148	20		TOTAL	4	7	74	107

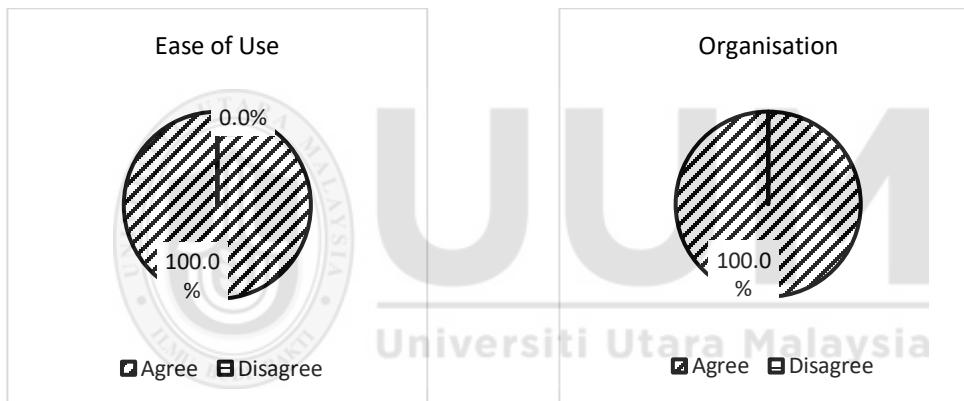
SD – Strongly Disagree; D – Disagree; N – Neutral; A – Agree; SA - Strongly Agree

Appendix R

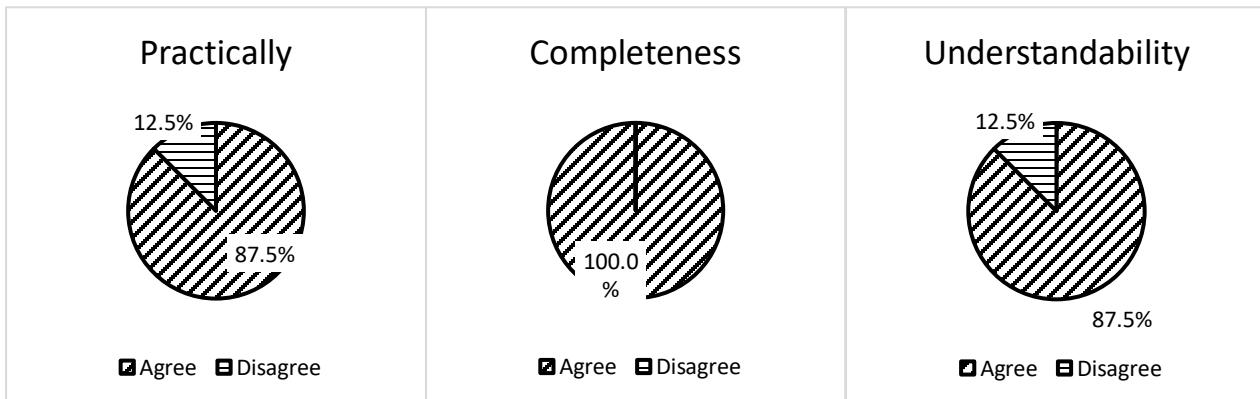
Result for Model Presentation



Result for Content Arrangement



Result for Task Performance



Cronbach's Alpha	N of Items
.838	5

Reliability Statistics (Efficiency)	
Cronbach's Alpha	N of Items
.853	7

Reliability Statistics (Effectiveness)	
Cronbach's Alpha	N of Items
.840	4

Reliability Statistics (Satisfaction)	
Cronbach's Alpha	N of Items
.844	4

Reliability Statistics (HI) Accessibility)	
Cronbach's Alpha	N of Items
.839	4

Reliability Statistics (Overall)	
Cronbach's Alpha	N of Items
.739	2

Descriptive Statistics

	Mean	Std. Deviation	N
Applikasi ini akan diulang penggunaannya	3.8667	1.15667	25
Applikasi ini akan digunakan setiap hari	3.8000	1.24667	25
Kandungan pembelajaran dalam aplikasi ini sangat sesuai untuk saya	3.9333	1.1177	25
Kandungan pembelajarannya sama seperti yang dipelajari di sekolah	4.0333	1.13334	25
Fungsi Vibrate dan flash dalam aplikasi ini amat membantu saya	4.1000	1.18888	25
Notifikasi dalam aplikasi ini amat membantu saya	3.6000	1.10812	25
Help video dalam aplikasi ini amat membantu	3.7500	1.14433	25
Terjemahan teks daripada bahasa isyarat sangat membantu saya untuk lebih faham	3.9000	1.20321	25
Kandungan aplikasi ini mudah difahami	3.8670	1.22801	25
Kandungan aplikasi ini mudah untuk dipelajari	3.81733	1.21441	25
Kandungan dalam aplikasi ini diterangkan dengan jelas	4.0834	1.04566	25
Semua tugas dalam aplikasi ini dapat diselesaikan	4.0333	1.08866	25
Semua tugas dalam aplikasi ini boleh diselesaikan dengan mudah	4.0000	1.04211	25
Semua butang menu yang disediakan berfungsi dengan baik	3.9333	1.03851	25
Dengan aplikasi ini, matlamat pembelajaran mudah dicapai	3.8666	1.09657	25
Warna dan fon yang digunakan sangat menenangkan	3.8165	1.06581	25
Rekabentuk aplikasi ini dibangunkan secara kreatif	3.9000	1.17533	25

<i>Semua butang menu yang disediakan berfungsi dengan baik</i>	3.7333	1.10311	25
<i>Applikasi ini mudah digunakan</i>	3.7333	1.11796	25
<i>Applikasi ini membuatkan saya rasa gembira selepas menggunakananya.</i>	4.1000	1.18891	25
<i>Persembahan aplikasi ini menyeronokkan</i>	3.6000	1.10781	25
<i>Applikasi ini membuatkan saya berasa teruja untuk menggunakaninya lagi</i>	3.7500	1.14407	25
<i>Antara muka aplikasi ini sangat menarik</i>	3.9000	1.20333	25
<i>Applikasi ini mudah dilayari</i>	4.1000	1.18854	25
<i>Bagaimanakah pengalaman anda semasa menggunakan aplikasi ini secara keseluruhan?</i>	4.0000	1.04211	25

