Mobile-Heutagogical Practices among Student Teachers: Its Pedagogical Affordances and Challenges

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Abstract—The integration of Information and Communication Technology (ICT) in the classroom for learning is becoming important to improve student engagement and interaction. This is in line with the educational transformation towards achieving Higher Education 4.0 in Malaysia. Education 4.0 (Edu 4.0) is in line with the Industrial Revolution 4.0 (4IR) and underpin the Malaysia Education Blueprint 2015-2025. There has been a recent surge in published studies on Mobile-Heutagogy (M-Heutagogy), with most studies has been conducted in developed countries, where the outcomes of the studies have revealed that M-Heutagogy has significant impacts on Edu. 4.0. Against this backdrop, this paper aims to discuss the M-Heutagogy pedagogical affordances of such a tool, the challenges that it poses, and the pedagogical change that is entailed for the adoption of the M-Heutagogy in the classroom. As a preliminary investigation in Malaysia, this study was carried out based on the phenomenological perspective of selected student teachers concerning the above affordances and challenges of M-Heutagogy through interviews. It was revealed that the use of such a novel learning tool helped spur their students' interest, stimulate their curiosity, and improve their confidence in learning scientific concepts. In particular, the use of M-Huetagogy has proven can help to improve student participation in the learning process through more intense discussions among student teachers, which led to an improved understanding of learning concepts. However, the main barriers to full integration of such a tool in teaching and learning were attributed to the lack of technical support, teaching skills and confidence, and suitable facilities.

Keywords—Mobile-Heutagogy, student teachers, pedagogical change, teaching technology

1 Introduction

Over recent years, a wide spectrum of technologies has been widely used in the educational realm, encompassing all levels of education from preschool education to tertiary education. Such use is not limited to the educational sector as many cutting edge technologies have also been used in sectors related to commerce and economy, among others. From the historical perspective, the use of technology in the classroom was made prominent by the use of the personal computer (PC), which has given a lasting

impact on the teaching and learning process throughout the world. Invariably, however, technology is mainly used as a learning tool for students rather than as a teaching tool for teachers [15, 21-23]. Efforts to use technology are gaining traction on a global scale, especially in higher institutions and universities. It is well documented in the news that the presence of the Fourth Industrial Revolution (4IR) has some impact on the education sector, including higher education [18]. The 4IR means a comprehensive and rapid change in the industry that is closely related to the rapid development of technology [6]. This revolution is a concept that spread the Internet of Things, Big Data, Artificial Intelligence, Augmented Reality, social media, cloud computing, and robotics. This means the technology will gradually replace human labor through the use of machines, robots and Internet applications in the business and manufacturing world. Since the revolution begins to take place in everyday life, especially in the future, the Higher Education Institutions (HEI) needs to take on the challenge of developing quality human capital with tacit knowledge that can be applied in the workplace [11-13, 16]. Besides, PdP 4.0 has been introduced to achieve Higher Education 4.0 that arises from 4IR and needs several transformations.

There has been a recent surge in published studies on M-Heutagogy, with most studies being conducted in developed countries, where the outcomes of the studies have revealed that M-Heutagogy has significant impacts on Edu. 4.0 [1-2, 5, 9, 14, 18]. M-Heutagogy is well documented for its succeeding in the online learning environment. Indeed, based on previous research, Blaschke (2012) and Eachempati, KS, Komattil and Ismail (2017), to create and cultivate 21st self-determined learners, Heutagogy is best implemented with the suitable latest learning and teaching technologies (Mobile Apps) such as Google Docs, e-Portfolio, Twitter, Diigo, YouTube, Quizziz, MindMap and Wikipedia. Arguably, in the advancements of educational technologies in teaching and learning, mobile devices have empowered the user with the ability to interact via various social media interfaces for and in learning.

Overall, heutagogy is self-determined learning that rooted in andragogy and applied a holistic approach, such as a learner-centered approach [1, 3, 9]. Heutagogy promotes the role of human agency in teaching and learning process [10], which means that learners are free to determine their own learning, how they learn and how they prove that they have mastered the learning topics even though they still need the engagement of their teachers or instructors. The heutagogical approach can be viewed as a progression from pedagogy to andragogy to heutagogy, with learners likewise progressing in maturity and autonomy [23]. More mature learners require less instructor control and course structure and can be more self-directed in their learning, while less mature learners require more instructor guidance and course scaffolding [2, 3, 17].

With the advancement of educational technology in teaching and learning, the integration of mobile learning with heutagogical practices has been proven its effectiveness [4, 15, 24-26]. M-Heutagogy is an extension of heutagogy approach which suitable for the 21st century and in line with the Education 4.0 concept. With M-Heutagogy, it improves learners' critical thinking and reflection, increases learners' motivation and engagement, and learners can control their own learning. Besides that, M-Heutagogy in this study also encompassed Education 4.0 (Refer Figure 1).

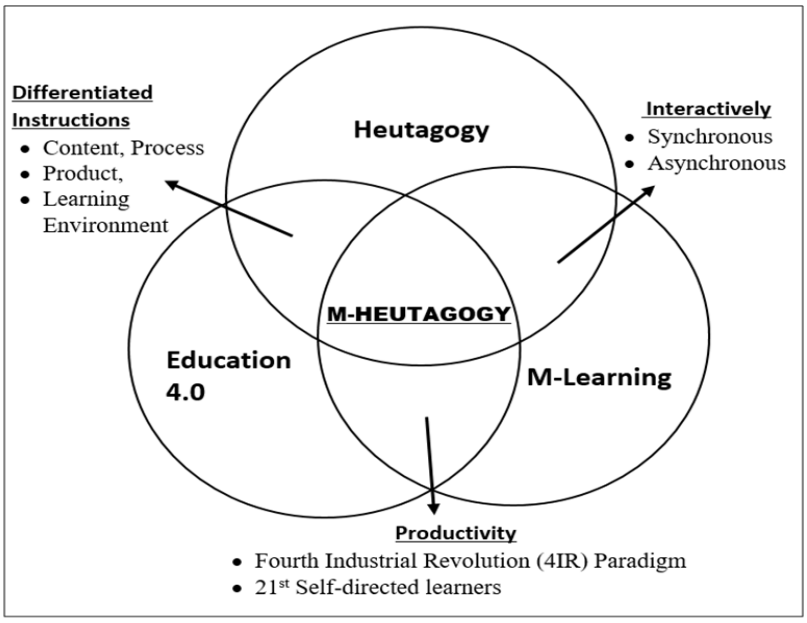

Fig. 1. The Principle of Mobile-Heutagogy (M-Heutagogy) in this study

M-Heutagogical practices support an interactive teaching method to enable students to learn actively by interacting via various mobile tools simultaneously. Essentially, the M-Heutagogy practices allow the learners respond and interact with teachers or educators. In principle, the difference between the M-Heutagogy and other pedagogical practices is that the students can be conveniently and easily communicate and give answers to the questions prompted by the teachers. As such, the teacher can remain in front of the classroom and still be able to interact with the technology. With the use of mobile features and tools, the teacher can focus on teaching without having to move around constantly, which can distract his or her students. Also, the M-Heutagogy can help the teacher to use several media, such as text, audio, video, and graphics, to enrich student learning by capitalizing on various senses. The teacher will no longer have to prepare and use other teaching tools or devices, such as an audio and video player. Interestingly, the teacher can use mobile devices to record short video clips of learning or teaching activities.

Furthermore, through the M-Heutagogical practices, it helps the teacher to make learning more meaningful and engaging by connecting such a device to online sources, such as websites, YouTube, or Google Maps. Such a connection helps contextualize learning in a real-world scenario, allowing them to learn more purposeful. Surely, such learning will have a huge and lasting impact on student learning. Moreover, the teacher or students can touch and move pictures or objects displayed on the screen, making learning more interactive and interesting. In particular, students can interact with their friends more readily by writing-learning concepts, ideas, or points on the mobile screen and prompting their friends to respond and discuss accordingly. Such a discussion can

be highly educational as studies have shown that the use of the mobile can help improve interactions between the teacher and students, which leads to better academic performance [25, 26].

Most of the studies conducted in the West have shown that the use of the heutagogical practices has made a significant pedagogical change in teaching and learning. Unlike the traditional blackboard, the new practices are more than a pedagogy approach for teachers in that they can be utilized by all students in a classroom. In this regard, teachers must adapt their teaching heutagogoy by incorporating various mobile tools in their teaching practice, as research has shown that the success of the integration of technology in a curriculum is heavily dependent on pedagogical practices [23]. As such, teachers need to learn and explore the functionalities of the mobile to ensure it can be used as both a teaching tool and a learning tool.

Admittedly, the heutagogical that incorporates the mobile will be different from the conventional heutagogy teaching method, with the former being more aligned to constructivist learning. With such teaching practices, learning is no longer confined to presenting facts and figures to students in a passive way, but it has more to do with helping students to learn independently and develop ideas related to scientific concepts. As highlighted by Papadakis (2018), the effective use of the mobile in heutagogical practice entails a new way of a teaching approach that focuses on the specific use of such a novel device. In order to make the mobile-related devices a tool that supports collaboration among students, its use must be beyond than writing words on its screen or projecting an image. Hence, the teacher has to provide ample opportunities for students to help project themselves more prominently in learning sessions by allowing them to use the tool individually. In such collaborative learning, the teacher should arrange and monitor students' learning activities to ensure they have a clear focus of a particular subject and to achieve the intended learning objectives. The responsibility of the teacher is not only to learn and familiarize with the hardware and software of such a learning tool, but also to understand how it can be used to contribute to attaining the learning objectives in a meaningful manner.

2 The Study

Ample evidence can be found in the literature indicating that technology-driven learning can help engender diverse learning experiences, such as interactive, cooperative learning, among students, including student teachers. There has been a recent surge in published studies on M-Heutagogy, with most studies being conducted in the developed countries, where the outcomes of the studies have revealed that M-Heutagogy has significant impacts on Education. 4.0 (Edu. 4.0) [1-2, 5, 7, 9, 10, 13].

In Malaysia, the level of the use of teaching technology among student teachers in higher institutions or universities has come under the scrutiny of many scholars, with many lamenting what they believed to be low, especially in Malaysia context [7]. Such lamentation is hardly surprising as preliminary studies conducted by several researchers have shown many lecturers, especially novice, have been quite reluctant to use mobile in their lecturing practice. Based on several interview findings, most such educators in

tertiary institution or universities, they seemed to be grappling with issues of how to use the different teaching practices with the most appropriate method. To make matters worse, a majority of teacher educators lacked sufficient knowledge and skills to incorporate teaching technology in the design of their teaching activities especially related to M-Heutagogical practices in their daily instruction. Such teachers also indicated that it would almost impossible for them to edit the educational software to cater to the needs of student teachers based on different aspects of learning.

Admittedly, student-teacher have different needs, personalities, and beliefs, which have to be taken into account is using technology in teaching and learning. In general, most teacher educators were willing to learn new ways of teaching methods such as M-Heutagogy. To date, several studies have been carried out to determine the use of M-Heutagogy for student teachers of various backgrounds and courses or programs. Such studies revealed that most teacher educators in tertiary institutions or universities have related to carrying out M-Heutagogical practices in their teaching and learning.

Indeed, the level of integration of M-Heutogogical practices among teacher educators is on alarming stage. Another problem that is impeding the full integration of technology in teaching and learning stems from the lack of knowledge and skills related M-Heutagogy. Virtually, many teacher educators do not understand the M-Heutagogy concept and how it can help in self-directed learning. Lack of knowledge and skills regards to M-Heutagogy makes implementing quite challenging given that pedagogy behind M-Heutagogy is mainly concept which to be mastered before integration could happen.

As from the informal study findings explained above, the researchers believe that the time has come to understand the affordances and challenges of M-Heutagogical practices in higher institutions or universities, with which the latter can design their teaching activities that are deemed suitable for school students by taking into consideration the various aspects of students' learning styles, cognitive developments, and intelligence.

Therefore, this study was undertaken to introduce the M-pedagogical practices among student teachers, to highlight its advantages, and to identify potential challenges that lie ahead in such an endeavor in the Malaysian context.

3 The Context of the Study and Methodology

As discussed in the previous section, the M-Heutagogy is a relatively new teaching tool for student teachers in tertiary institutions and universities in Malaysia. To determine the advantages of such teaching practices, the researchers carried out a small-scale case study based on the phenomenological perspective of teachers concerning the teaching practice of using the M-Huetagogy in the field of science. Based on the expert opinions of several experienced academics and content experts, the researchers identified four (4) student teachers who had an excellent record of practising the M-Heutagogy in schools. They have used M-Heutagogical practices in their teaching practice and understand clearly how it works. They used M-Heutagogical practices as part of their routine teaching duties in the classroom during their teaching practice times. Such experience was important to ensure the student teachers would be fully prepared and confident

to use such a novel teaching practice, as the lack of which could make its integration in the teaching and learning would be futile.

In the data collection stage, the researchers carried out a series of semi-structured interviews in which the student teachers were asked several questions to probe their opinions regarding the advantages of M-Heutagogy learning and its challenges in implementing the new way of practices.

Before the data collection stage, the researchers have carried out the tested data collection instruments to ensure the validity of the instrument used. This is vital as data collection (semi-structured interview questions) were adapted from several questions that had been validated and used in previous studies in the same discipline to identify the strength and weakness, and its effectiveness of m-Heutagogy as daily teaching and learning. Since the validity of the instrument is an essential process in the initial stage of research, content validity, criterion and construct validity of this study had been conducted necessarily by the researchers. The researchers believed that it is ultimately necessary to ensure the validity of content used in an instrument to procure that the items correspond to the research objective.

In the process of testing the validity of the instrument, subject matter experts had been given a set of instruments and attached with the objectives of this study on the effectiveness of m-Heutagogy. Four (4) subject matter experts have reviewed and commented on the items. Feedbacks and advice were shared by the subject matter experts were taken into consideration. Thus, few alterations on the tone of language, paraphrasing of difficult or ambiguous words and an appropriate number of items were adjusted from the original items. Additionally, the necessary amendments were also made to avoid ambiguity and confusion. Hence, respondents would have a better understanding of each item, thus producing reliable responses as desired by the study needed to be measured. Minor changes to grammatical errors have been done accordingly. Since the items in the instrument were adapted from previous literature, the items have been broadly and extensively used by many numbers of researchers, thus resulting from positing high content and criterion validity.

Reliability, on the other hand, refers to a recurrence of the same process producing the same outcome. Subsequently, the results acquired from a pilot study conducted prior to the actual experimental design is essential in revising the reliability of an instrument used. Thus, researchers have carried out triangulation reliability testing. In the triangulation reliability testing, researchers have to conduct the research at different times and locations. Different interviewers have been requested to ask the same questions to the participants in different time and location. Based on the result collected, the reliability level of the data collected as high as about all the feedbacks from participated respondents were similar.

Indeed, in order to comply with the research ethic, participants have received Consent Information Sheet regards to the research by means of verbal explanation and attached the consent letter. Participants signed the forms. By having these steps, the participants clearly understood the objectives and structures of the research.

4 Findings and Discussion

The findings of the interviews are discussed based on three themes, namely the M-Heutagogical practices in cultivating self-directed learning paradigm, the advantages and challenges of the M-Heutagogy as follows:

4.1 M-Heutagogical practice in cultivating self-directed learning paradigm

The analysis of the interview data helped the researchers to determine several themes related to the teaching process with the use of the M-Heutagogical practices, namely the self-directed learning paradigm, didactic support, self-integrated and interactive activities, and self-guided assessment. For didactic support, the teachers indicated that they mainly used the mobile integrated with heutagogy approach to spur their students' interest, stimulate their curiosity, and improve their confidence in learning scientific concepts. The teachers specifically indicated that the mobile-interactive features were adequately fun to help students interact with the learning contents. The student teachers also said that they used the M-Heutagogy can ensure learning activities take place interactively, which could improve student learning and their focus. By making the mobile as in an integral part of their heutagogical practice, they genuinely believed students could engage in active, collaborative learning by using such a novel teaching method, such as the latter could share and manipulate texts or objects displayed on the touch screen, if they integrated with interactive whiteboards, as they discussed the facts or concepts of learning topics. The findings is in line with many previous studies indicated that mobile learning help cultivating self-directed learning. Students are more independent and higher autonomy when integrating with technology tools. According to Ushioda (2011), autonomy among learners are also expressed within the learners' attitude towards the lesson and are more likely to become willing in the classroom activities and there is an ability to show a level of independence in regulating ones' learning when educational technology tools were used. It was also apparent that students in m-Heutagogy learning classroom started to become more responsible in their own learning compared to conventional learning. This change in students' behaviour could be particularly influenced by the availability of contents and access to activity through blended learning in the classroom. Students would stop at a point of uncertainty seeking for clarification from the teacher as a guidance. These are the most apparent examples of autonomy within learners portrayed in the blended learning classroom.

In terms of the self-assessment-driven practice, the student teachers indicated that they had a strong interest in diversifying self-assessment techniques with the use of the mobile in heutagogical practices, which could serve as a potent instructional method for self-diagnostic, self-formative, and self-summative assessments. The former can be carried out by involving students to determine their prior knowledge. Self-formative assessment can be performed by providing students hands-on experiences of a phenomenon and the self-summative assessment can be conducted by assessing students' explanations of the findings of their investigation into learning concepts.

4.2 The advantages of the M-Heutagogical practices

The research subjects were prompted to highlight the experiences in integrating M-Heutagogy in the teaching and learning process. A majority of them agreed that teaching with such an instructional teaching method was highly efficacious, especially in teaching the basic concepts based on the National Curriculum Standard provided by the Malaysian education system. Such a finding concurs with previous statements, emphasizing the many benefits of the mobile related educational technology tools in teaching and learning [23, 25]. For example, teachers can connect mobile to online sources, such as news websites, YouTube, and Google Maps, from which the latest and accurate information can be obtained. Using such information, students' assignments or tasks will be free from errors or mistakes, effectively making their works valid and reliable. This assertion is consistent with the findings of a study by [1-2, 23, 25], indicating that the integration of mobile or related educational technology in teaching practice can help create a flexible space to support interactive communication between a teacher and his or her students in exploring scientific concepts using relevant latest information. Given this flexibility, it was hardly surprising to note that most of the student teachers interviewed said that the M-Heutagogical practice made their classes not only interactive but also interesting as opposed to conventional teaching. Also, they indicated that with the mobile features available in a notebook, hand phone, iPad, or related mobile devices were very useful in that relevant images, pictures, graphics could be accessed with ease, and it had several examples of the latest interactive activities. In addition, they could use the online toolkit to update information.

More revealingly, the student teachers contended that diverse modalities of learning supported by the mobile-related tools and its innovative features would have a huge impact on motivating today's young students. Such contention is to be expected given that such a novel teaching tool can support text, audio, video, animation, and graphics, with which teachers can use to explain scientific concepts or principles more effectively to their students. From the cognitive standpoint, teachers can teach their students based on their learning styles with the use of multimedia materials and contents. Such relevant materials can be easily accessed given the capability of the mobile to connect to the Internet, through which information can be located and downloaded. It is worth to note that what sets apart the mobile or other technologies that integrated with Heutagogy is that the former is easy to engage with students, allowing the teacher to remain in front of the class while interacting with his or her students. In the interviews, the teachers highlighted such a capability that they found to be extremely helpful in helping them to communicate with their students without any restraints or barriers, which are common in the conventional teaching methods.

These endless opportunities that a technology encompasses can perform better than is expected with equal support from face-to-face learning where it helps in enhancing learning as to cater different learning styles in a classroom. The purpose sole of technology usage in this paper is manipulated to suit a lesson rather than displacing the teacher's role in a classroom to make lesson more motivating, engaging and updated with the current needs of today's learners. Moreover, teaching and learning materials could be saved and kept on a hard disc, a thumb drive, or software gallery, which could

later be edited or updated for future learning activities. One of the student teachers interviewed highlighted this unique feature in M-Heutagogy that allowed him to reuse diagrams and pictures in other classes that followed.

Coupled with the ability to support multimedia presentations, the M-Heutagogical practice could become a potent teaching and learning tool that enhances student learning. Also, easy navigation enabled them to return to any part of a learning presentation to reinforce their students' understanding of learning concepts that students found difficult to comprehend. With such a learning tool, students' works could be readily accessed to be used as references in the learning activities.

4.3 Pedagogical challenges

Like other educational teaching methods, the M-Heutagogical practice is not without any challenges, which are more intense in teaching students at the school level. Invariably, issues regarding technical support, class management, and teachers' knowledge and skills have been impeding the smooth integration of M-Heutagogy in the teaching and learning process. For example, as highlighted in the interviews, the student teachers were quite hesitant at first to adopt a new teaching approach or instruction that was more appropriate for teaching with the Heutagogy paradigm, which could be attributed to their negative perceptions, believing that the use of mobile (e-learning) was highly technical. Such perceptions were not without reasons, and rightly so, as there were several occasions in which they had to seek help from technicians to help deal with some technical issues. Hence, student teachers must be given sufficient technical support to ensure they can use the mobile-related educational technology tools with ease and comfort. Otherwise, teaching can be severely interrupted or delayed, forcing them to revert to conventional teaching methods.

The interviews also revealed that the choice of a classroom for teaching and learning using the M-Heutagogy was an important topic of discussion among the teachers. For example, one of the student teachers argued that such mobile-related educational teaching tools were not suitable to be used in existing classrooms, as the configuration of classroom facilities, such as tables, desks, and lights and the available spaces prevent students from interactive freely in the process of implementation of M-Heutagogical practices. To further compound such a problem, lights entering into the classroom were simply too bright that obscure texts and graphics displayed on the mobile device's screen. Cleary, such problems were not unexpected given that the design of existing classrooms is based on the conventional teaching approach which does not involve the use of such a teaching tool.

Notwithstanding, classroom setting is the vital in conducting m-Heutagogy practices. According to participated teachers viewpoints, they have to come early to classrooms if they were to use the M-Heutagogy approach effectively, as they needed to make some minor physical adjustments to the classroom settings, such as rearrange the table setting for discussions and the electric power available especially related to classroom setting. This finding empirically validated the previous study done by [23-23].

Clearly, all the important points discussed above show that the successful integration of M-Heutagogy in teaching and learning relies heavily on the preparedness of teachers

to learn and use the new way of teaching method, such as the mobile-related educational tools, which in turn entails them to adopt a new teaching practice. In this regard, assert that teachers need a piece of new knowledge and skills to integrate mobile in heutagogy teaching method to optimize the M-Heutagogy in practice [21]. They also need to undergo professional development training to help them make a smooth transition from existing pedagogical practice to a new one that focuses on technology integration. In the interviews, the teachers indicated that using such a novel M-Heutagogy had entailed them to make such a transition. Such finding is consistent with other findings of studies on technology integration that revealed the introduction the mobile in heutagogy method will lead to a change in the instructional approach [8, 13]. Admittedly, the optimal use of the mobile in heutagogy practices will require substantial investment in terms of training to help practicing teachers to acquire the skills and confidence to integrate mobile in heutagogy paradigm.

5 Conclusion

In this study, student teachers' perspective of the affordances and challenges in using the M-Heutagogy was explored through a series of interviews. From the standpoint of instructional practice, it was revealed that the use of such a novel teaching method (Heutagogy) with the integration of mobile learning helped spur their students' interest, stimulate their curiosity, and improve their confidence in learning scientific concepts. More importantly, they asserted that M-Heutagogical practices helped improve student participation in the learning process through more intense discussions among students, which led to an improved understanding of learning concepts and cultivate self-directed learning environments.

In terms of benefits, virtually all the teachers viewed that the integration of mobile learning in heutagogy teaching approach to be highly beneficial, given its ability to support interactive, flexible, and multi-modal learning. With the capability to connect to the Internet and the support for multimedia presentation (consisting of text, graphics, animation, audio, and video), learning was made more rich, appealing, and convincingly meaningful. Hence, the M-Heutagogical practices helped spur their students' interest, stimulate their curiosity, and improve their confidence in learning scientific concepts.

The results obtained from this study sanctions some of the aforementioned benefits identified in the previous literatures. Among the benefits of m-Heutagogy learning in this study reveal that the instruction allowed room for knowledge exploration among students and teachers, the ability to reduce boredom and lethargic in classrooms as lessons were very engaging and interesting especially related to the features of instant feedbacks from both teacher and learners, cost effective in terms of materials and contents used in the lessons, as well as encouraging creativity among learners through challenging classroom activities. Apart from that, m-heutagogy learning in this study is also seen as a powerful learning tool to the teacher where teaching materials were made possible online. Having that, learners can access it anytime and anywhere. Additionally,

record keeping of students work was also made feasible thus possible in gradually reducing teacher's workload.

From the perspective of M-Heutagogical challenges, the teachers argued that the main barriers to the full integration of mobile-related educational tool in teaching and learning were attributed to personal and organizational factors. For the former, the student teachers contended that training and guidance were critical to allaying initial fears or hesitation in employing heutagogy teaching approach with mobile devices, which is to be expected when someone is exposed to the unfamiliar condition. For the latter, the student teachers implored that school administrators take the necessary measures to facilitate the smooth integration of mobile learning in heutagogy approach are essential and vital to embark the benefit of M-Heutagogy teaching approach. The provision of suitable and adequate school facilities, technical support, and professional development training will able to reduce the resistance of change among practicing teachers. In particular, teachers have to train how to integrate mobile devices in heutagogy teaching approach, which as a tool for a wide spectrum of learning activities, such as a collaborative tool to support cooperative learning and cultivate self-directed learning paradigm.

Overall, the findings of this study strongly suggest that there will be several challenges in maximizing the integration of mobile devices into heutagogy teaching approach in daily teaching and learning, requiring teachers to make the necessary changes in their heutagogy practice that will be more attuned to teaching using related mobile-related educational technology tools. Clearly, more studies are entailed, preferably on a larger scale, to fully determine the full impact of M-Heutagogical practice of learning throughout Malaysia.

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