

# **PERSONAL BIOMETRIC INFORMATION FROM WEARABLE TECHNOLOGY TRACKED AND FOLLOWED USING AN EPORTFOLIO A CASE STUDY OF EHEALTH LITERACY DEVELOPMENT WITH EMERGING TECHNOLOGY IN HONG KONG HIGHER EDUCATION**

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## **ABSTRACT**

In this paper we will show our research approach and discuss potential outcomes. The research project started in January 2016.

To understand eHealth literacy development in higher education in Hong Kong, the researchers will conduct a multiple case study including 20 students from an undergraduate course. Each of them will use a wearable device over a period of five months, reflect on emerging personal data, document their thinking and action in an ePortfolio-based journal, and engage in an online forum. The ePortfolio, specifically developed for this research, will allow the students to critically reflect on their progress and for the researchers to intervene at any time on the issues related to the participants' postings. Evidence regarding change in eHealth literacy at the beginning and end of the intervention will be collected with a well-established questionnaire. To understand the qualitative aspect of these changes, semi-structured interviews pre and post intervention will be conducted. Interviews and data from reflections and forum posts will be analyzed and triangulated to understand emerging issues influencing the development of eHealth literacy. After establishing a case report for each of the participants a cross-case analysis will be performed. The study will deliver theoretical and practical recommendations for researchers, teachers and policy makers in higher education to track, support and explore development of new literacies, and in particular, development of eHealth literacy. It will also investigate the applicability of the ePortfolio as a reflective and autonomous learning tool. Furthermore, it will create opportunity for further research on learning using emerging wearable technologies.

## **KEYWORDS**

Wearable technologies, eHealth literacy, ePortfolio

## **1. INTRODUCTION**

EHealth literacy is one of 'new literacies' important for today's living, working, learning and socializing. These new literacies include, for example, visual, information, digital, critical and media literacies. In spite of its importance, eHealth literacy is not well developed for students in higher education (e.g., Stollefson & Hanik, 2011). Wearable technologies like wristwatch trackers open an opportunity for development of eHealth literacy by delivering in real-time, situated, personal biometric information. Having access to these data and critically using it will stimulate individuals' interests in health issues, mediate personal inquiries regarding emerging health issues, and mediate deployment of interacting new literacies while locating and engaging with health information resources.

## 1.1 Ehealth Literacy

In this section an overview of the evolving concept of eHealth literacy is presented, its interdependence to new literacies, and possible implications related to mediating factors for the development of eHealth literacy using personal biometrical data.

The Education for All Global Monitoring Report (2006) describes literacy as “a concept [which] has proved to be both complex and dynamic, continuing to be interpreted and defined in a multiplicity of ways” and as possible understanding it proposes to use: “literacy as an autonomous set of skills” and “literacy as learning process”. The present study will use “literacy” or “development of literacy” following the Global Monitoring Report – namely as - “learning process”. The concept of eHealth literacy is based on the definition of health literacy formulated by Ratzan and Parker (2000).

Though it is a widely recognized assumption, that being able to find, interpret, critically analyse and apply health related content using Web services is important, many college students lack health literacy skills (Stellefson & Hanik, 2011). EHealth literacy itself has been formulated by Norman & Skinner (2006a) as the ability to seek, find, understand, and appraise health information from electronic sources and to apply the knowledge gained to address or solve a health problem. This composite skill requires the ability to work with technology, think critically about issues of media and science, and navigate through a vast array of information tools and sources to acquire the information necessary to make informed decisions (Norman & Skinner, 2006b). Norman and Skinner (2006a) propose a validated questionnaire (for English language) to assess an eHealth literacy using a scale called eHEALS. EHEALS has also been validated for different other languages (German: Soellner, Huber & Reeder, 2014; Dutch: Van der Vaart et al., 2013; Chinese: Koo, Norman, & Chang, 2012; Japanese: Mitsutake et al., 2011).

## 1.2 Development of eHealth Literacy

While Norman & Skinner (2006a) describe 8 items in their eHeals scale to assess eHealth literacy. Van der Vaart introduces the term of eHealth categories. The 6 categories emerge from their experiment with rheumatic disease patients asked to find Health related information on two different Web pages. For the present research we decided to use the eHealth literacy assessment tool proposed by Norman & Skinner (2006a) and to use the term ‘category’ as issues surrounding the process of development of eHealth literacy.

### 1.2.1 Biometric Tracker and ePortfolio as Mediating Factors for Development of eHealth Literacy

The recent NMC Horizon Report (NMC, 2015) predicts that wearable technologies will have an important role in learning in higher education. It defines such technology as follows: “Wearable technology refers to devices that can be worn by users, taking the form of an accessory such as jewellery[...] or a jacket. The benefit of wearable technology is that it can conveniently integrate tools that track sleep, movement, location, and social media. There are even new classes of devices that are seamlessly integrated with a user’s everyday life and movements” (NMC, 2015). The integration of metrics for gravity, acceleration, temperature and light sensors (e.g., for heart rate measurement) enables proactive information delivery to the person wearing the tracking device.

The context in which the described interactions between human beings and the wearable technology takes place, can be linked to learning concepts and instructional methods like knowledge building, situated, self-regulated and active learning. In situated learning it is important to create a meaning from the real activities of daily living where learning can also occur in an informal setting and connects prior knowledge to new contexts (Brown et al., 1998). Zimmerman and Schunk (2008) link learner’s motivation directly to self-regulation. According to these researchers, a self-regulated student is a student who is metacognitively, motivationally, and behaviorally engaged in its own learning processes and in achieving its own goals. Active learning as defined by Bonwell & Eison (1991) refers to any instructional method that engages students (actively) in the learning process. Active learning requires students to do meaningful learning activities and to reflect what they are doing. Scardamalia and Bereiter (2003) describe Knowledge building by an activity resulting in the creation or modification of so called public knowledge, knowledge that lives ‘in the world’ and is available to be worked on.

Wearable technologies can also provide a vehicle and act as motivator for the effective use of IT tools and resources from the internet and other information and media channels. Students' learn to work with their own, real data delivered over a long period of time, and through these experiences they may become more critical about encountered information deriving from other sources.

A scaffolded interaction with one or more skilled partner(s) enables a learner to construct meaning through hypothesis formation and testing (Crotty, 1994; McLoughlin & Oliver, 1998; Vygotsky, 1978). In a 10-year study of 800 Canadian graduates, Evers, Rush & Bedrow (1998) identified four generic competencies esteemed by the workplace: 1) managing self, 2) communicating, 3) managing people and tasks, and 4) mobilizing innovation and change. Focusing on the first two of these competencies, the need to foster lifelong learners who possess skills conducive to lifelong learning and peer collaboration is clear. One digital tool, which may have the potential to develop these skills within a social constructivist paradigm is the eportfolio. Drawing on a range of literature, the eportfolios adopted in pilot projects implemented by the PI position ePortfolios as a personalised digital collection of artefacts, which are organised in a purposeful way to assess growth over time and scaffolded through continuous formative feedback from the tutor. This contrasts with the ePortfolio's frequent (mis)use as a tool for only summative assessment, absent of formative feedback and student ownership. Thus, in this context, the eportfolio is a tool with the potential to both *enhance* and *showcase* learning. It is the intention of the investigators to integrate scaffolded peer collaboration/dialogue, enhancing portability and relevance beyond the learning institution, and fostering skills conducive to lifelong learning. Documenting the biometric tracker in their own eportfolio, it is intended that students will continuously learn to critically assess personal information and the abundantly available on line information, organize it and present for peers/tutor. This in turn will enhance critical literacy, cause concerns about health related topics and stimulate further inquiry, such as searching and finding reliable and relevant health information channels related to their interests. Critical literacy enhancement may also raise questions related to the management of the security of personal data in the internet and lead to a better awareness of the importance of personal data protection.

## **2. PROCEDURE AND DATA COLLECTION**

To understand the qualitative aspect of the changes in eHealth literacy semi-structured interviews pre and post intervention will be conducted on a sub-group of 20 students.

During one academic semester 20 students from the course: 'Physical Activity and health' will be recruited. Participants will be asked to sign ethic clearance and the consent to participate to the study including the permission to publish the results of the study after anonymizing provenience of the collected data. Students of a higher education institution in Hong Kong aged 18 years and above. To understand eHealth literacy development in higher education in Hong Kong an existing ePortfolio tool will be used. Each of the participants will use a wearable device over a period of five month (1 semester), reflect on emerging personal data, document their thinking and share and communicate to other participants (optional) in their ePortfolio. The ePortfolio will allow the researchers to intervene at any time and to ask questions related to the participants reflections. Evidence regarding change in eHealth literacy at the beginning and end of the intervention will be collected with a well-established questionnaire. The same questionnaire will be used for Pre and Post intervention. Interviews and data from reflections and forum posts will be analyzed and triangulated to understand emerging issues influencing the development of eHealth literacy. After establishing a case report for each of the participants a cross-case analysis will be performed.

The participants will be asked to reflect weekly about their use of the trackers. It will enable participants to enter their experiences with the biometric data, like relevance of difference sensor data, lifestyle adaptations (like e.g. more sleep), special situations (e.g. hike, changes in hear rate during activity) and how these experiences lead to specific searches and actions in the web and/or in their real social network. Students will be able to publish different formats of reflections as text, hyperlinks to health related web pages and images. Students have access to all their reflections and can retrieve past events of their reflective ePortfolio, described above.

## 2.1 Methodology

The presented research will employ a multi case methodology study to explicate the affordances of wearable trackers, as they emerge from the ten students using this technology. The study will constitute an inductive, hypotheses generating naturalistic inquiry, whose aim is to accumulate an understanding and propose recommendations relevant to the study context (Flyvbjerg, 2006). It will focus on “the larger picture, the whole picture, and begin with a search for understanding of the whole” (Janesick, 2000, p.379). The research findings will provide a broad picture of the events taking place in particular contexts, allowing readers to draw their own conclusions (Stake, 2003). The sample size of the presented study, conducted over 5 months with an exemplary group of 20 students across the four key areas, is sufficiently large for a multi case methodology study (Small, 2009).

A consistency technique will be applied across the 20 cases to allow comparability. The adopted case study methodology is adequate for retrieving a well rooted set of arguments and recommendations related to the learning process performed by the ten students during the intervention related to eHealth literacy.

## 3. EXPECTED OUTCOME OF THE STUDY

1. To investigate if an ePortfolio tool/exercise for enhancement of reflective and autonomous learning and test one possible application, namely using wearable technologies like Activity Tracker as opportunity for development of students' eHealth literacy.
  - 1a. To use the Activity Tracker to elicit non formal, situated learning opportunities through the situated personal reflection in the ePortfolio and individualized feedback of the teacher.
  - 1b. To use ePortfolio as tool for enhancing reflective learning initiated through the specific feedback of biometric information.
  - 1c. To use eHealth literacy-as parameter to measure the enhancement of health awareness.

## 4. PRELIMINARY RESULTS

First results will be presented at the conference.

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