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Examining Students' Perception of Using Crowdsourcing based Mobile Apps for Environmental Education and Research Experiences.

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Abstract: In the context of complex environmental problems facing societies, it is desirable to enhance public awareness of environmental issues. In response to this challenge, environmental education is an integral part of curriculum utilized at all levels of education, including universityeducation. Environmental education (EE) is now considered to be the most prominent instrument to influence human behaviour towards more environmentally sustainable patterns. However, it is often criticized for being reductionist and empirical and thus not optimal for training next generation of students who are expected to formulate solutions to complex, interdisciplinary environmental issues. We propose that new technologies (crowdsourcing apps) that are being used in research settings to solve interdisciplinary problems may also be used for experiential learning of environmental science. New technologies and growth of digital media are profoundly affecting today's university students. So, in view of the pervasiveness of new mobile technologies in today's life and learning, it is essential to lead the instructional process with integrating mobile technology in developing students' educational and research experiences. In so doing successfully, it is imperative to know the perception of students who are the real and prime users and beneficiary of such approach. Henceforth, the centre of attention of this paper is to investigate university students' perception and effectiveness of a crowdsourcing based mobile App for environmental education and research. The specific topic considered is land use and land cover change due to human activity. The students were provided with hands on 'experience of the Land Use Land Cover mobile application.Survey method was used to collect the data.The study reports that the students have a positive perception regarding the use of mobile application, based on the Open Data Kit (ODK), along with the Google Earth Engine (GEE) in implementing experiential learning approach for environmental education and research.

Keywords: Crowd sourcing, Mobile Application, Environmental Education and Research App, Experiential Learning

1. Introduction

Integration of Mobile learning technologies into educational setting settings is still in its infancy, and the development of new models, methods, systems and applications are needed to be put in place for successful integration. Teachers need to re-blend the present learning environment in higher education to ensure an efficient and effective mobile learning environment. The rapidly advancing mobile computing technologies along with abundant mobile software applications make ubiquitous mobile learning possible (Johnson, Adams, & Cummins, 2012). The innovation in mobile apps has raised interests among educators because it facilitates teaching and learning (Johnson et al., 2012). Apps are being developed at a rapid speed and are intensively used by students. Apps can be easily downloaded and used on a mobile phone device. Today's learners as digitally literate, 'always on' always connected and reachable. They want to stay connected and be reachable, they also want to experiment and have community oriented personalities and characteristics (Oblinger et al.,2005) They are

collaborative and multitasking learners who like to study in a group-based environment (McMahon, M. et al 2005). Why can't we take this opportunity to use the technology to improve student's collaboration, and interaction thus making the learning environment effective, fun and challenging?

Mobile Apps for teaching and learning are breakthrough technologies in recent years, and teachers should use them and apply their methods to this effective learning environment. They should acknowledge that mobile phones along with educational and communicational Apps can be an efficient learning tool if integrated properly within the currently used settings at universities, as this could enhance teaching and feedback, thus simplifying the learning process for students, by providing experiential learning. Universities should implement this type of mobile learning environments and technologies and encourage students to use it and integrate it into the curriculum. It may create a learning environment that matches and fits today's digital learner's life style and improves their access to learning content, and makes the learning process, creative, collaborative and challenging. It is high time for universities and educators to re-design and revamp the forms of education according to the changing dynamics of today's learners, thus providing strategic solutions to various existing problems. The application of mobile learning technologies will potentially place universities at the forefront of pedagogical practice and addresses learners needs for flexibility and portability, as mobile learning and its Apps are considered the real authentic, ultimate anywhere, anytime, on demand and with any device, learning experience.

Behind this 'practical axioms' of learning prospect, this study aims at:

1. exploring Teacher Educators' 'perception' about crowd sourcing based mobile application in environmental education and research experiences
2. examining students' expectations of mobile application use in experiential learning;
3. developing an up-to-date crowd sourcing based mobile apps mediated environmental curricula; and
4. Preparing & equipping learners as workers and citizens in an information centric society.

2. Background

Environmental education should encourage children to become good stewards and to think globally but act locally regarding the environment and environmental issues. Environmental education is an invaluable tool for teaching critical thinking skills and applying these skills to the students' everyday world. The ultimate goal for environmental education is to create environmentally literate global citizens (Disinger& Roth, 1992). In order to accomplish this, educators must help students acquire a better understanding of their environment and natural resources as well as environmental issues affecting them. Educators can enhance children's explorations by providing them with interesting and enriching experiences that help them to explore outside of their direct environment and make connections and inferences within and between different phenomena in the environment. We create meaningful learning experiences when we help children to move beyond simple observations to more complex activities that require higher-level thinking and collaboration with peers (Jana Willis &Brenda Weiser, 2014).The power of Environmental Education and experiential education acting together is recognized by workers in the field. Thus using an experience-based approach to an environmental topic invites students to examine their own effects on the environment, whether positive or negative. We propose that new technologies (crowdsourcing apps) that are being used in research settings to solve interdisciplinary problems may also be used for experiential learning of environmental science. New technologies and growth of digital media are profoundly affecting today's university students. So, in view of the pervasiveness of new mobile technologies in today's life and learning, it is essential to lead the instructional process with integrating mobile technology in developing students' educational and research experiences. In so doing successfully, it is imperative to know the perception of students who are the real and prime users and beneficiary of such approach. Henceforth, the centre of attention of this paper is to investigate university students' perception and effectiveness of a crowdsourcing based mobile App for environmental education and research.

3. Crowdsourcing based Mobile Applications

It was with the development of web 2.0 4 that several technological trends and movements appeared: open data, big data and crowdsourcing. The proliferation of smart phones has paved the way for Apps that use crowdsourcing to gather their data. The wide availability of smart phones now makes it easier than ever to devote them to data gathering, with or without actual human intervention. The rapidly growing capabilities (sensors, hardware, software, social networking) of smart phones and tablets, coupled with their portability and accessibility, make them one of the most impactful ICTs in the world today. One of the most exciting developments made possible by the rapid spread of mobile technology is crowdsourcing. By engaging citizen scientists in spatially and temporally distributed measurements of processes, a significant yet inexpensive stream of useful information can be generated. There is clear and accelerated progress in the application of mobile technologies in support of crowd sourcing. Crowdsourcing apps are changing everything from the way we travel, to the way we work, to the way we gather information.

This study reports on the perception of university students regarding the efficacy of a mobile application - Public Environmental Education and Research App (PEERA), based on the Open Data Kit (ODK), along with the Google Earth Engine (GEE) to implement experiential learning approach for environmental education and research. The app functioning relies on open data and crowd sourcing.

4. PEERA: Public Environmental Education and Research App

A mobile application (Android platform), based on the Open Data Kit (ODK), for populating a Google Earth Engine based Land Use Land Cover ground truth database is developed. The ODK (Open Data Kit) is a set of tools that allows data collection using mobile devices and data submission to an online server, even without an internet connection or mobile carrier service at the time of data collection. The Open Data Kit (ODK) based application is intended for crowd sourcing of ground truth information regarding the nature of Land Use and Land Cover (LULC). The LULC ground truth data, in conjunction with algorithms and Land sat satellite imagery available through Google Earth Engine (GEE), will provide community based organizations the capability to generate LULC maps with relative ease.

Figure 1: Screenshot showing the home page of PEERA user module

In an experiential learning approach the App is used to collect first-hand information regarding land use and land cover upon which the students can reflect and form concepts to solve environmental issues. When the class starts, the teacher can purposefully pose a problem or issue in front of the students for them to solve. She/he should decide what the students should learn or gain from the learning experience. Effective educational interventions should provide pupils with the kind of education that appeals to and has a personal meaning for them. It is most probable that we do not learn anything unless we have a clear personal motive for doing so (Rogers, 1957), i.e. unless it is connected to our personal experiences. A question of the kind "How is your neighbourhood changing"? can be posed to the students. Once begun, the facilitator should refrain from providing students with all of the content and information and complete answers to their questions. Instead, guide students through the process of finding and determining solutions for themselves.

Now the students can go out of their classrooms and use the mobile application to collect a sample of geo-locations for different land cover types. Here the learner will be undergoing the concrete experience which emphasizes personal involvement in everyday situations. In this stage, the learner would tend to rely more on feelings than on a systematic approach to problems and situations. Students perform a hands-on minds-on experience with little or no help from the instructor. They collect three or four ground truth data and upload it to the server. Now the students can visualize the collected data in a fusion table and will discuss their experiences as a group. Discussions will focus on their thoughts and will provide differing views on the topic. In the classroom, reflection can take the form of an individual activity, within small groups, or with the entire class. Children construct an understanding of the world around them, and then experience discrepancies between what they already know and what they discover in their environment. Students analyze the generated satellite imagery and construct conceptual understanding that integrates one's observations into logically sound theories. They classify satellite imagery and understand how their neighbourhood has changed over the years. They can visually see how urban regions grow, crop lands shrink and forests disappear. In the last phase students generate solutions to make decisions or to solve real life problems.

4. Methodology

4.1. Research Context and Participants

The study was conducted in university of Kerala .The participants of this study were M.Ed studentsM.Phil students and Research Scholars of Department of Education. They were chosen on random basis. A total of 52 students took part in this study

4.2. Data Collection Procedure & Questionnaire

Survey methodology was facilitated through the use of a one page written research questionnaire for this study. The questionnaire was given to the sample after conducting a workshop based on the above mentioned mobile application. In the workshop the author presented a detailed overview of the developed mobile App based on crowd sourcing followed by hands on experience session. Both the sessions were highly interactive. There were multiple choice questions (MCQ) as well as question asking for short suggestions, offering the respondents a free reign. Most of them responded to the questionnaire willingly, and had made some admirable suggestions. The questionnaire for this survey was designed to determine students' self-reported perception and efficacy of mobile technology supported experiential learning for capturing the ground reality. Out of 52, a total of 38 questionnaires were returned representing a response rate of 73%.

5. Results

5.1. Data Analysis

This study administers mixed methodology. From the collected data of questionnaire, the percentage of respondents offering the same answer was computed using MS Excel to produce research findings. The questionnaires were tabulated to record the responses from each participant for each option of the questions. Results were reported both quantitatively and qualitatively. Figures are drawn below to sum up the frequency of responses.

The 1st question was designed to determine the students' perceptions about using mobile App as an experiential learning tool. The student respondents overwhelmingly answered (57+40) % underlining the strong support with reference to their ties and attitude to digital technology integration in the teaching/learning. 12% of the students responded negatively due to their belief that mobile technology adversely affects their learning characteristics

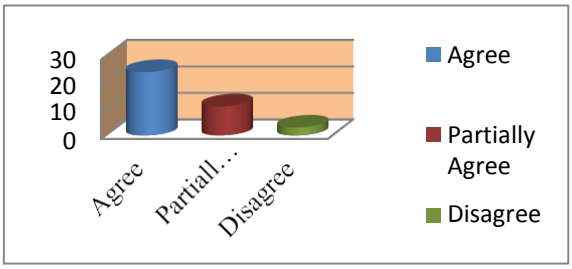

Figure 2:Students' choice of PEERA as an experiential learning tool

The 2nd question seeks to discern the range of efficacy and appropriateness of mobile technology-mediated teaching-learning into environmental education. Here, according to students' opinion (78+20=98%), mobile App-enhanced experiential learning approach creates Inquiry-based learning which engages students in the investigative nature of science. The result of this hypothesis infers students' positive perceptions about technology-enhanced experiential learning in environmental education. It assures that The PEERA educational approach promotes the inquiry based model, using it to transform the scientific findings of formal education to real-life accomplishment.

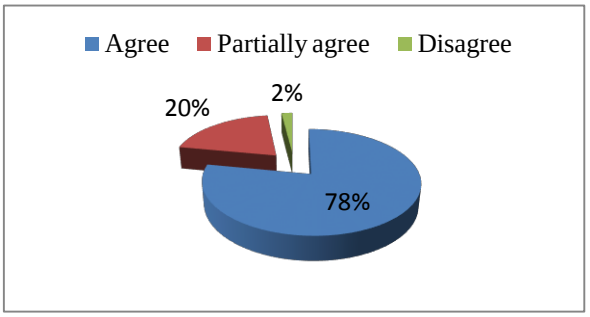

Figure 3:Students' choice about the efficacy of PEERA in Environmental Education

The 3rd question was designed to capture students' reflection regarding teachers' role in a mobile App-mediated mode of pedagogy. Data analysis reflects that PEERA drives the changing trajectory of the teachers' role from a dominator of knowledge to a facilitator. The student participants (64% + 31%= 95%) agreed that technology integration in experiential learning of environmental education facilitates higher degree of teacher-student interaction and collaboration. Consequently, it develops construct an understanding of the world around them, and then experience discrepancies between what they already know and what they discover in their environment. So, App based experiential learning approach enhances learners' autonomy of study and at the same time, reduces teacher-dominated lesson practices. But many of them had anxiety on how a digital migrant can fully explore the potential of a digital native.

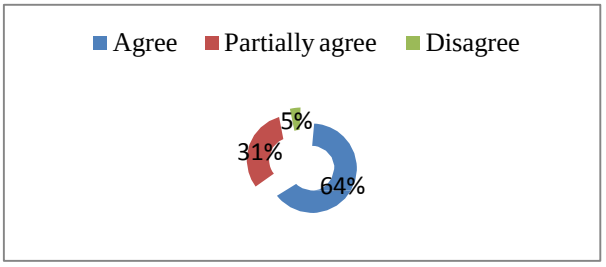

Figure 4: Students' reflection regarding teachers' role as a facilitator

The 4th question explores students' self-reported assertion and perception about crowd sourcing based mobile App as experiential learning tool for environmental education.Most of the participants suggested that App based experiential learning approach contribute in perceptively to the learners' autonomy catering to their real life career. . Here students are engaged and feel empowered as creators

of substance. Here students both experience and generate knowledge. They learn from thoughts and ideas about the experience. Each step contributes to their learning. Providing an experience alone does not create experiential learning. Experiences lead to learning if the participant understands what happened, sees patterns of observations, generalizes from those observations and generate new knowledge. Apart from this, some students show their nuances regarding the authenticity of the data collected and very few term it as a troublesome and time consuming technique.

Finally, the 5th question offered the participants a free reign to spell out their own favourable or disfavour able perception or reflections regarding mobile App in learning. The responses reflect the real perceptions of the students representing an average rate of 77%. Most importantly, a contributing number of participants 85% suggested that mobile Application based experiential learning enables students to generate solutions to make decisions or to solve real life problems. Some of them discussed the authenticity of the data collected.Agood number of participants showed anxiety regarding the implementation of tool in educational institutions due to lack of smart phones and the versatility of digital immigrant teachers in using the App. Here, the author designed participants' self-reported reflections into structured answers.

7. Conclusion

This article contributes significantly to the effectiveness of PEERA,crowd sourcing based mobile App by investigating students' perception and efficacy of the above said based on data analysis and research findings. The findings reflected that university post graduate students demonstrated positive perception of mobile App technology adoption into their learning practices and it affects their learning situation through captivating and motivating into learning engagement more than traditional pedagogy. Interestingly, 80% of the participants believe it enhances self-directed autonomy of study; facilitating higher degree of teacher-student interaction promoting inquiry and collaborative learning.

In light of the findings of the present paper, we propose that crowd sourcing applications and other associated technologies may be utilized to implement experiential learning in environmental education and it may have the potential to significantly improve attitudinal change in future generation towards environment.

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