

Innovative Project-Based Learning in Yangzheng Primary

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Abstract

In response to Singapore Ministry of Education Curriculum 2015 (C2015) to equip our students with the appropriate skills and mindsets to prepare them in a fast changing globalised world, the Project Work (PW) Curriculum in Yangzheng Primary School was redesigned to incorporate the teaching and learning of 21st Century skills in particular Collaborative Learning (CoL) and Self-directed Learning (SDL) which focus on developing thinking, communication, collaboration and management skills in students. The school adopts the Project-based Learning that incorporates experiential learning in real-life situation to provide stimulus to arouse students' interest in learning such competencies. An ICT-facilitated Learning Journey (LJ) Package was designed as school interdisciplinary project work in various core subject areas in English, Mathematics, Science and Social Studies. The LJ was contextualized in accordance to the Situated Learning Theory supported with mobile technology to make learning robust and fun for students. The school-based project work leverage on the field research to engage students in technology infused learning with SDL and CoL through the use of assessment tools to evaluate students on their application of knowledge, collaboration, communication and presentation as school informal assessment.

This paper focuses on an exploratory study of Primary Three students (9-years old) in using mobile learning during their outdoor LJ. It investigates on using appropriate assessment tools to evaluate students in the acquisition of 21st Century skills through mobile learning.

Keywords

21st century skills; self-directed learning; collaborative learning; mobile learning

Introduction

In 2013, Yangzheng Primary School (YZPS) reviewed and revised the school's PW curriculum to have greater alignment to Ministry of Education's (MOE) initiatives and 21st Century Competencies by incorporating Real-life Experiential Learning, Collaborative Learning (CoL), Self-directed Learning (SDL) and the use of Information Communication Technology (ICT) tools into Interdisciplinary PW.

In the revised PW Curriculum, a mobile learning LJ was redesigned, under the guidance of a MOE Educational Technology (ETD) officer, to contextualize learning in accordance to the Situated Learning Theory. The use of ICT tool, online learning site during the LJ helps to engage the mobility of students in SDL and to instill greater fun elements learning in real-life situation and stimulate students' interest in learning. The use of online collaborative document provides a good platform to facilitate students in the acquisition of SDL and CoL.

The PW Taskforce was formed to revise the project task that facilitated SDL and CoL. A review was conducted on the existing assessment tool, a Feedback Form adapted from MOE PW Unit on its relevance and adequacy in assessing SDL and CoL. A match on the intended outcomes was done between the Feedback Form and the MOE framework to enhance the development of 21st century competencies, specifically in the area of SDL and CoL. Upon evaluation, an attempt was made to use perception survey and ICT collaborative tools to unravel more information on the impact of SDL and CoL in students.

Literature Review

Vavoula and Sharples (2009) shared the framework and ideas on the theory of mobile learning to re-conceptualise learning and recognise the essential role of mobility and communication in the process of learning. In their framework, learners move from one context to another such as switching locations, social groups, technologies and topics in formal and informal settings to take ideas and learning resources gained in one location and apply or develop them in another.

From their viewpoint of social-constructivist approach, learners actively build knowledge and skills through practice within a supportive community to bring about effective learning through a curriculum which focuses on being learner-centred, knowledge centred, assessment centred and community centred. This implies that assessment is mapped to the ability of the learners and tasks to build on the skills and knowledge of students, enabling them to reason from their own experience.

According to Lave, J. & Wenger, E. (1991), they shared the views that learning was situated within authentic activities, context and culture. Learning was more likely to take place when information is contextually relevant to the learner and when information can be put to use immediately. In a study by Hansen and Bouvin (2009), it was advocated, "Learning does not occur in a void but it needs to be contextualised". Therefore learning is more likely to take place when information is contextually relevant to the learner and when information can be put to use immediately. Likewise, Wei & So (2012) provides a holistic evaluation framework on contextual mobile learning which reviews that learning approach and the task design should mutually enhance leaning motivation and improve the cognitive achievements of the learners. In revamping the school interdisciplinary project work, the team adopted this idea in designing outdoor learning task for students.

Engaging students in the learning of 21st century skills in particular CoL and SDL stresses the need to develop thinking, communication, collaboration and management skills in students. With reference to the white paper on 21st century skills written by a team from the Assessment and Teaching of 21st Century Skills project (ATC21S), it suggests that learners collaborate and work together to solve a common challenge, which involves the contribution and exchange of ideas, knowledge or resources to achieve a common goal. We draw on the recommendation by the monogram on CoL published by MOE to develop a safe culture and environment whereby students are empowered in generating a diversity of ideas and knowledge which they can work and improve upon. These improvable ideas will be further co-constructed and synthesised to formulate community knowledge and simultaneously it resumes collective responsibility among students.

The notion of SDL as a 21st century skill put forward by Gibbons (2002) stresses the importance of developing ownership of learning to motivate learner to persevere in the learning process to achieve a learning goal. In the monogram on SDL published by MOE, it focuses on how to facilitate students' self-assessment of performance tasks for SDL through the use of rubrics. It also discusses the assessment of teachers on students' SDL through observing their actions and behaviour using a set of behavioural indicators and attributes that correspond mainly to the three dimensions of SDL i.e. ownership of learning, self-management and self-monitoring and extensions of learning. These sets of behavioural attributes for SDL and CoL would be adopted and adapted for our exploratory study.

Research Question

How to enhance the acquisition of 21st Century skills in students through the use appropriate assessment tools and mobile learning?

Methodology

Profile of Pupils in Class 3B and Miss May Tan

Miss May Tan is a member of the PW Committee and is trained to conduct SDL & CoL facilitated project work using mobile technology. The 40 students in her class were heterogeneous in ethnicity, gender and academic abilities. She was supported by two teachers and one ETD Officer during the outdoor LJ.

Procedures for Data Collection

Using the case study approach, the research focuses on collection of data gathered through the Feedback Form on PW on CoL, Perception Survey on SDL and data on pre and post study were collected via online collaborative documents. The following table describes the procedure for implementing project work instruction and the data collected.

Phase	Activities in YZPS Project Work Curriculum	Data Collected
Pre-activity	A. KWL on Amazing Facts about Birds B. Our Learning Log C. Online Collaborative Document Miss Tan created an online collaborative document for each group and shared with all the members in the group.	Evidence of SDL Evidence of SDL Pre-study on SDL
Learning Journey	D. Mobile Learning Journey	Online collaborative forms Spreadsheet

Post-activity	E. Online Collaborative Document for SDL F. Project Work – Comparison Chart on Amazing Birds G. Perception Survey on SDL	Post-study on SDL Feedback Form on Project Work (CoL) Data on SDL
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Project Work Curriculum in YZPS

It was redesigned to incorporate the teaching and learning of 21st Century skills in particular CoL and SDL, which stresses the need to develop thinking, communication, and collaboration and management skills in students. This is achieved by having a PW Task and a learning journey that are designed to facilitate the teaching and learning of the above skills.

Activity A: “KWL” on Amazing Facts about Birds

A ‘*Know, Want to Know, What I Learnt*’ (KWL) learning organizer below helps students to experience SDL by having them establish their learning gaps and leading them to gather information on what they want to learn about birds of their choice.

What I Want to Learn				
Bird E.g. Penguin	Physical Appearance	Diet	Movement	Habitat
K				
W				
L				

Activity B: Our Learning Log

It was another learning organizer used to state the learning outcomes to be attained by the students. This laid the expectations for teaching and learning and allowed students to manage their own learning. Students were led to own their learning when they were guided to establish their learning gaps. Through the log, they were taught how to use it to manage their learning in the project work and learning journey. Finally, they evaluated their own learning outcomes. They completed the learning log at the end of project work as a self-reflection exercise on their learning.

Our Learning Log			
	Learning Objectives	Output	Evaluation on
1	I learn about Diversity of Birds - Birds are different in their physical appearance, diet and abilities	Google Document	self-directed learning (SDL)- I own my learning
2	I learn more about the different types of claws the birds have and their functions	Google Document	SDL- I extend, manage and monitor my own learning
3	We learn to use the information gathered to complete and present a chart on the similarities and differences of the birds we have learnt about	Google Document Comparison Chart	collaborative learning (CoL) communication skills

Activity C: Online Collaborative Document

Miss May Tan created an online collaborative document for each group and shared with all the members in the group.

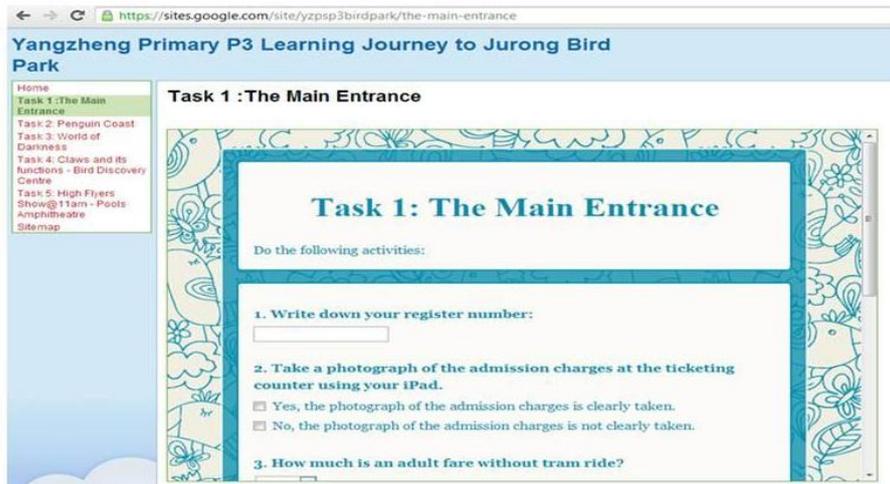
Activity D: Mobile Learning Journey

Lesson was carried out in a mobile learning environment where pupils moved from one exhibit to the next and also across learning spaces from school to the situated learning trail. This mobile learning design is adapted from pedagogical practices derived from studies done in FutureSchools@Singapore and MOE Educational Technology Division (ETD).

Procedures

Primary 3B class students were equipped with mobile handheld devices, iPads mini in a three-hour mobile learning journey at Jurong Bird Park. The class of 40 students was divided into four groups with a teacher facilitating each group of 10 pupils. Each student was provided an iPad mini and each group had Internet connection via the use of a donker. As students moved from one exhibit to another, they were guided by instructions via online learning site and task contextualised for the specific exhibit. These tasks were designed for each exhibit in the trail to achieve both curriculum objectives and develop students' SDL & CoL competencies, and higher order thinking skills.

Task Type: Contextualization, Interdisciplinary, and Collaborative



Activity E: Online Collaborative Document for SDL

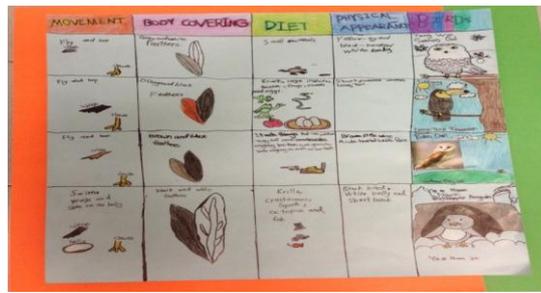
The online collaborative document below showed a comparison table and would be owned by each group to allow each student to complete what he or she learnt about the particular bird species he or she chose for the project work. Pupils would research on the type of birds and complete the comparison table. After the SDL-facilitated activity, students experienced and demonstrated CoL attributes when they contributed to their group's learning in the final product, a Comparison Chart on Birds illustrated in Activity E.

Group 6 of 3E		What I Want to Learn		
Bird	Physical Appearance	Diet	Movement	Habitat
Penguin	Body Covering- feathers	Fish	Waddle	Cold places with fish
Owl	Feathers	Bugs, rats, mice	Fly	South-central Arizona

Eagle	Feathers	Small mammals like rats, rabbits	Flying and swooping	Mountains with water, food, branches, South America
Parrot	Feathers	Fruit-papaya, apple	Fly	Jungle

Activity F: Project Work

The final learning artefact was presented in the form of a Comparison Chart which was used by the students in their group presentation in class.



Findings and Discussions

For informal assessment, a PW Feedback Form adapted from PW Resource Package (CPDD 1999) was used to evaluate the students on their application of knowledge, collaboration, communication and presentation. In addition, the Perception Survey adapted by ETD was used to evaluate the demonstration of self-directed learning behaviour and a post-test study using online collaborative document to evaluate students' self-directed learning.

Using Project Work Feedback for CoL Assessment

Upon matching the Feedback Form adapted from MOE, the components on Teamwork and Communication Skills provided some appropriate assessment on CoL.

 Yangzheng Primary School Primary 3 Project Work 2014 Project Work Feedback Form		Approaching Expectation (AE)	Meeting Expectation (ME)	Exceeding Expectation (EE)
Graphic/ Visual Presentation with explanatory brief (Comparison Chart)	Appropriateness of Comparison Chart	<ul style="list-style-type: none"> Chart is not attractive: in design, layout and colour <input type="checkbox"/> Ineffective use of picture and writing <input type="checkbox"/> 	<ul style="list-style-type: none"> Chart is attractive in design, layout and colour <input type="checkbox"/> Some effective use of pictures and writing <input type="checkbox"/> 	<ul style="list-style-type: none"> Chart is very attractive in design, layout and colour <input type="checkbox"/> Very effective use of pictures and writing <input type="checkbox"/>
	Presentation ➢ Thoroughness in explanation and evidence of knowledge application	<ul style="list-style-type: none"> Comparison made on the birds is not clear at all <input type="checkbox"/> Little relevant content, correctly written <input type="checkbox"/> 	<ul style="list-style-type: none"> Comparison made on the birds is clear <input type="checkbox"/> Some relevant content, correctly written <input type="checkbox"/> 	<ul style="list-style-type: none"> Comparison made on the birds is very clear and comprehensive <input type="checkbox"/> Most relevant content, correctly written <input type="checkbox"/>
Collaboration (CoL)	Teamwork: ➢ to complete the project work learning activities Communication Skills: ➢ turn-taking ➢ active listening ➢ suspending judgement	<ul style="list-style-type: none"> Some team members were unable to complete given task within time <input type="checkbox"/> Little evidence of collaboration among team members <input type="checkbox"/> Little evidence of good communication skills demonstrated <input type="checkbox"/> 	<ul style="list-style-type: none"> The team was able to complete allocated tasks within time <input type="checkbox"/> Some evidence of collaboration among team members <input type="checkbox"/> Some evidence of good communication skills demonstrated <input type="checkbox"/> 	<ul style="list-style-type: none"> There was good time management by all team members. <input type="checkbox"/> Good evidence of collaboration among team members <input type="checkbox"/> There was good communication skills demonstrated <input type="checkbox"/>
Total Points	Circle the highest no. of ticks and record the overall grade for the group (Best Project for the exhibition to be based on this segment)			

Using Perception Survey for SDL Assessment

The Perception Survey shown overleaf reflected high percentage ranging from 75% to 100% on qualities that demonstrate SDL. The possible low percentage for Question 14 could be due to the fact that each student held a mini-iPad and managed the online form submission independently without showing others how to perform the task. The students reflected a low percentage for Question 11 as they might not realise that the focusing advantage of the iPad could be helping them to see things more easily.

Survey Questions SDL Qualities - Ownership, Management, Extension of Learning		Strongly Agree / Agree
1.	I pay more attention when the learning journey involves the use of ICT.	94%
2.	ICT lets me work whenever I want to	81%
3.	I get more involved with my work when I use ICT	94%
4.	ICT helps me to organise information because I can see examples in pictures, in video or other things that I can look at	100%
5.	Using ICT makes me keen to go for the learning journey	92%
6.	ICT helps me to finish a piece of work that sometimes would be difficult to finish without it	83%
7.	ICT makes me want to work more by helping me to make my work look better	100%
8.	I work better with ICT because I can change things I have already written or done in other ways without making my work look a mess	86%
9.	ICT helps me to work with other people	86%
10.	I work better with ICT because it helps me to put my ideas together	78%
11.	I work better with ICT because it helps me to see things more easily	61%
12.	I like working with ICT because it helps me work better with other people	83%
13.	Working with other people when using ICT helps me learn better	75%
14.	I like being able to show other people how to do things when I am using ICT	61%
15.	I can work longer without losing my concentration when using ICT	78%

Source of Survey: Adapted from MOE Monograph on Self-Directed Learning with ICT: Theory, Practice and Assessment. Singapore: Ministry of Education.

Using Online Collaborative Document for SDL Assessment

Based on the finding, 60% of the groups reflected 50% improvement in their learning and 30% of the groups reflected 75% improvement in their learning.

Findings from Google Doc used for conducting 'KWL' on 4 birds chosen by the pupils										
Pre-test: Complete a group google document showing what each member knows about a chosen bird Post-test: Each group will verify the information completed in the pre-test group google document and add in more information learnt in the learning journey to the Bird Park.										
Animal (Each may choose different kinds of birds)	Corrected and new facts of each bird (outer covering, diet, movement, habitat) will be counted as learnt knowledge									
	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8	Group 9	Group 10
Bird 1	2	2	2	2	0	3	0	1	3	1
Bird 2	3	0	3	2	2	4	1	1	3	1
Bird 3	1	1	4	3	4	3	4	3	3	1
Bird 4	1	3	4	2	4	4	2	1	2	4
Average for each group	2	2	3	2	3	4	2	2	3	2

Benefits of Mobile Learning observed in the Learning Journey

Learning Outcomes for Students

With every student provided with an iPad mini, they used the camera feature to take photographs of the feature of the birds and their surroundings. The use of camera feature in mobile tablet developed students' primary observation skill. They learnt what to focus on in an animal. They learnt what to observe and how to observe them. Students accessed online learning site and forms using their iPads mini. These collaborative ICT tools enhanced the facilitation process. The use of online learning site, with its embedded questions and instruction, guided students in their thinking through the trail. Students took greater ownership of their learning by sourcing for information on the ground (SDL). Students were able to take on different roles in a group setting to complete the learning tasks (CoL).

Ease in Monitoring

Online collaborative forms provided a platform for students to consolidate their learning through immediate feedback submission. Teachers were able to monitor students' learning immediately when the forms were submitted. Teachers were able to correct misconceptions on the spot. The use of collaborative online documents allows students to consolidate their learning and share their artefacts for discussion with their group members.

Contextualized Learning

With the use of mobile technology and online platform, learning and teaching cut across time and space, bringing learning beyond the boundary of the curriculum time. Teacher and students were still able to participate in the learning from school to learning journey and then back to school. Learning became more participatory rather than didactic. Learning across time and space provides a seamless experience for students.

Ease in Collaboration

Technology used in the mobile learning provides a collaborative environment whereby students could share learning with ease and offer immediate feedback to their peers. Such social structure instituted in a learning situation heightens students' awareness of their own learning. Students also developed communication skill as they articulated their suggestions and learning online. Students developed higher order thinking skills as they engaged in peer-to-peer discussions; making observations and providing evaluations as they attempted the teachers' designed learning tasks.

Online collaborative document could be used to facilitate CoL when students contribute to their members' learning. The use of colour coding system could differentiate their peers' contribution and provide insight to the quality of SDL and CoL that is almost visually and immediately to them.

Limitations and Recommendation

Students' knowledge on ICT

Despite the younger generation being more exposed to ICT skills, many of them might not be familiar with the use of ICT equipment and iPad applications. Teachers need to ensure that there is at least one IT savvy student in each group to help their peers during the learning journey.

Teacher and Student Ratio

The ratio of 1 teacher to 10 students was adhered to throughout the learning journey. In the event of a trained teacher being on sick leave, parents' support could be tapped on for assistance. Provision need to be provided for just-in-time training when the need arises.

Internet Connection Failure

As students need to complete the activities via online learning site, Internet connection would be an important aspect. If there is any failure in the Internet connection during the learning journey, teachers would capitalize on the personal hot spot in their mobile phones for wireless connection. Hard copies of the activity booklet could also be used as replacement.

Limited time for activities

As students were only given three hours to complete the activities during the learning journey, much was required of the skilful teacher in managing students' expectation and time management. Hence, it is crucial for learning objectives and activities to be effective and meaningful by taking into consideration of the scope, depth and time. Students briefing and ground rules are certainly vital to ensure meaningful teaching and learning to take place.

Handling ICT Equipment

Students should be trained on handling the ICT equipment. A group leader should be assigned to each group to ensure members handle the equipment appropriately during the learning journey.

Unforeseen Circumstances

Some unforeseen circumstances such as the weather and haze might affect the implementation of the learning journey. Teachers should be prepared to modify research in the learning journey to online Internet search. SDL and CoL activities could still be carried out despite the change in the manner data was gathered.

Conclusion

The exploratory study conducted on the Primary Three students (9-years old) was impactful to our understanding of our students' acquisition of 21st Century skills. Our seamless mobile learning which allows mobility in our students to learn from the context of school to learning journey and back to school allowed SDL and CoL to be implemented purposefully and meaningfully.

The study revealed that our assessment tools were effective in providing us insights to the student's acquisition of the 21st century skills. The finding in the perception survey revealed a clear indication that demonstrated SDL. It was also evident that the students' responses in the survey were showing positive traits of SDL. With the study group being 9 years old, the SDL design was slanted more towards high in teachers' facilitation and low in students' control. It provides opportunities for students to extend learning by engaging them in the reflecting their learning and to allow students making connections between what they learnt in and out of school.

The analytical finding of the online collaborative document delivers good insights to the quality of SDL in measurable form. In addition, the Feedback Form has also provided good behavioural indicators that demonstrated CoL. There are good processes put in place to

scaffold SDL and CoL. They provide structured learning experiences for students to demonstrate good use of the learning organisers that built their awareness on the learning skills required in SDL and CoL.

For future direction, study could be made on exploring the possibility of acquiring SDL towards higher degree of students' self-managed learning and self-planned learning with high ownership of learning and extend learning beyond school's curriculum.

References

Chai, C.S., Lim, W.Y.,D., So,Hyo-Jeong & Cheah, H.M. (2011): *Advancing Collaborative Learning with ICT: Conception, Cases and Design*. Singapore: Ministry of Education.

Gibbons, M. (2002). *The self-directed learning handbook: Challenging adolescent students to excel*. San Francisco, CA:Jossey-Bass

Hansen, F.A. & Bouvin, N.O. (2009). *Mobile learning in context — Context-aware Hypermedia in the Wild*. *International Journal of Interactive Mobile Technologies*, 3(1), 6-21

Infocomm Development Authority of Singapore. *EdVantage - FutureSchools@Singapore*. Retrieved from <http://www.ida.gov.sg/Collaboration-and-Initiatives/Initiatives/Store/EdVantage-FutureSchools-Singapore>

Lave, J. & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*, Cambridge: University of Cambridge Press.

Vavoula, G. N. and M. Sharples (2009). *Meeting the challenges in evaluating mobile learning: a 3-level evaluation framework*. *International Journal of Mobile and Blended Learning*, Vol. 1, No. 2, 54-75.

Ministry of Education. (2010). Press Release on *MOE to Enhance Learning of 21st Century Competencies and Strengthen Art, Music and Physical Education*. Retrieved from <http://www.moe.gov.sg/media/press/2010/03/moe-to-enhance-learning-of-21s.php>

Ministry of Education. (2009). *The desired outcomes of education*. Retrieved from <http://www.moe.edu.sg/education/desired-outcomes/>

North Central Regional Educational Laboratory. (2003). enGauge 21st Century skills for 21st Century learners. Retrieved from <http://www.techlearning.com/techlearning/pdf/events/techforum/sd06/CherylSkillsBrochure.pdf>

Sharples, M., Taylor, J., & Vavoula, G. (2005): *Towards a Theory of Mobile Learning*. Retrieved from <http://www.mlearn.org/mlearn2005/CD/papers/Sharples-%20Theory%20of%20Mobile.pdf>

Tan, S. C., Divaharan, S., Tan, L., & Cheah, H.M. (2011): *Self-Directed Learning with ICT: Theory, Practice and Assessment*. Singapore: Ministry of Education.

Tan, L., & Koh, H.L. (2012): *Self-Directed Learning with ICT: Learning in the 21st Century* Singapore: Ministry of Education.

The Alaska Arts Education Consortium: Twenty-First Century Skills. Retrieved from <http://akartsed.org/new/wp-content/uploads/2010/01/PDFtwentyfirst-century-skills.pdf>

The Assessment and Teaching of 21st Century Skills project (ATC21S). *White Papers*. Retrieved from <http://atc21s.org/index.php/about/what-are-21st-century-skills/>

Yu Wei, Hyo-Jeong So (2012) : *A Three-level Evaluation Framework For a Systematic Review of Contextual Mobile Learning*. mLearn 2012: 164-171