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KODU GAME LAB - A TOOL FOR ENSURING QUALITY TEACHING-LEARNING FOR PUPILS IN PRIMARY SCHOOLS: CASE STUDY (SCHOOL IN NORTHERN FINLAND)

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The depth to which sophisticated technologies are entering into every facet of the society is causing a significant shift in where, when, and how as individuals and as a collective body work together, and how the educational systems should be structured to prepare students for a massive effective life of the 21st century. This shift, is the drive towards the use of educational games as a learning tool in schools and has led to diverse benefits and opportunities of computer game play.

The study examine in detail how Kodu Game Lab is used to foster quality teaching-learning process for pupils’ in primary schools. The aim was to understand collaborative learning interaction among pupils' using Kodu Game Lab. The participant of this study were seven 9 year old pupils’ (5 males and 2 females) from which five pupils’ were selected for intensive observation. Content analysis (CA) was used in analyzing the process by coding raw visual images and categorizing the frames into three levels of interaction. Those frames in which at least three nonverbal cues (facial expression, gaze and gesture) were used within the group were coded as High Level Interaction. Secondly, frames where there were at least two nonverbal cues used were coded as Medium Level Interaction. And thirdly, frames where at least one nonverbal cues used were coded Low Level Interaction.

The result show that one of the groups had High, Medium, and Low Level of Interaction while other (two groups) exhibit Medium and Low Level Interaction respectively. In addition, the findings shows that pupils’ interaction with their peers when using Kodu Game Lab is apparent through the use of nonverbal cues which results to High, Medium, and Low Level Interaction within the group. On the one hand, pupils’ interaction with the teacher when using Kodu Game Lab is also apparent through the use of nonverbal cues but the interaction level of pupil’s with their teacher is of Medium and Low level.
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1 INTRODUCTION

“The very essence of a game is play- playing with objects, ideas, relationships and strategies. It’s about thinking critically and creatively”. (Stapleton & Taylor, 2003)

Over the past years, the upsurge in the depth to which sophisticated technologies are entering into every facet of the society is causing a significant shift in where, when, and how as individuals and as a collective body work together, understand a technique to organize themselves, and how the educational systems should be structured to prepare students for a massive effective life of the 21st century.

One undeniable shift is the movement towards the use of educational video games as a learning tool in schools. This shift has led to diverse benefits and opportunities of computer game play. According to (Robertson & Good, 2005) encouraging children to play well designed computer games can be used to enhance their learning, enabling them to create their own computer games offers a further range of learning opportunities. Computer and video games are predominantly comprehended as a form of entertainment. Nevertheless, their presence is acknowledged as providing a powerful means for learning, both amid educators and the game development community (Stapleton, 2004). Smeets (2005) describes “powerful learning environments” as those which foster optimal learning processes such as rich contexts and tasks, active and independent learning, co-operative learning, and curriculum adaptation of the needs and capabilities of such individual people. In such an environment, learners are actively engaged (occasionally autonomously and sometimes collaboratively) on authentic, rich tasks which have been adapted to their individual needs (Robertson & Howells, 2008).

Students consider video games to be “cool” because it continually challenge player in interactive, visual - frequently three-dimensional, immersive environments (Stapleton & Taylor, 2003a). Moreover, this shows constant focus on the player experience which means giving the player total control within the game world.

Rouse III & Ogden (2010) describes game’s gameplay as the degree and nature of the interactivity that the game comprises, i.e., player’s ability to interact with the game-world and the game-world reaction to the choices players make. In addition, (Prensky, 2002) characterize it as the general activities and strategies game designers use to get and keep players engaged and motivated to complete each level and entire game.
Games, most specifically digital games such as console-based video-games and computer games have also become renowned for its rich learning contexts provision for players (Gee, 2003a; Gee, 2003; Norman, 2001; Papert, 1998; Prensky; Stapleton & Taylor, 2002; Stapleton & Taylor, 2003b). In addition, this has led to viewing games as educational technologies and, subsequently, having its application beyond the domain of entertainment only.

The word game is a system in which players engage in an artificial conflict, defined by rules, those results in a quantifiable outcome (Salen & Zimmerman, 2004). However, digital game further refines this definition by requiring the game system to incorporate technology. According to (McClarty et al., 2012) Simulations, augmented reality, and traditional video games all fall within this definition. Therefore, my study focuses on the use of Kodu Game Lab in teaching-learning process, more precisely in both student-student and teacher-student collaboration. Researches have shown that Kodu Game Lab increases students’ problem solving skills and critical thinking, improved collaboration and cooperation as well as student engagement (Pilot, 2009).

This study investigates the use of Kodu Game Lab in fostering teaching-learning processes in a Finnish primary school. More attention is paid on two crucial aspects: 1) student-student interaction and 2) teacher-student interaction. Earlier studies of the Kodu Game Lab limited most of their attention to problem solving skills and critical thinking development. Although, some explanatory study carried out using Kodu Game Lab indicates that it improves collaboration and cooperation as well as student engagement (Pilot, 2009). Therefore, I decided to pay attention to the collaborative interaction occurrence using the Kodu Game Lab. In addition, I have always been spellbound by educational games and also critical about how they are developed and the benefits they portray in the field of education. My Master’s Degree programme in Learning, Education and Technology gives me the insight to understanding the study of Kodu Game Lab from the lens of collaboration. In other words, how collaborative interaction process works while the Kodu Game Lab is in use.
2 THEORECTICAL FRAMEWORK

The Theoretical framework for this study is based on three theoretical areas: collaborative learning and computer-supported collaborative learning (CSCL), and collaborative interaction.

2.1 Collaborative Learning (CL)

The concept of collaboration and community have been offhandedly associated to the learning process for many years, nonetheless they have become catch expressions in the education in the 1980’s and 1990’s (Smith & MacGregor, 1992) and this are still the vogue expression and practices in the 21st century. The manifestation of collaborative learning in every educational discipline has allowed the strategy to be frequently called “innovative” and “new”, and have manage to engage student and teacher throughout much of the century (Smith & MacGregor, 1992).

There have been an ample amount of definitions for the term collaboration. Collaboration in a layman’s term according to Lipponen (2002) appears to refer to any activities that pairs of individual or a group of people performs together. Furthermore, he explains that amongst many researchers including those in academic fields, understood the term collaboration differently. However, within learning sciences, common to the definition difference of collaboration is that they all stress the idea of co-construction of knowledge and mutual engagement of participants.

Roschelle and Teasley (1995) stated that collaboration is “a coordinated, synchronous activity which is the result of a continued attempt to construct and maintain a shared conception of a problem”. Panitz (1999) stated that collaboration is a philosophy of interaction and personal life where individuals are responsible for their actions, including learning and respect the contributions of their peers. In other words, collaboration can be considered as a special form of interaction (Lipponen, 2002).

According to Smith and MacGregor (1992) the term “collaborative learning” is a parasol term for a variety of educational approaches that involves joint intellectual effort by students, or students and teachers together. They further explained that students work in two or more groups in a collaborative learning situation where they mutually search for understanding, solutions, meanings or product creation. In addition, Smith and MacGregor (1992) stressed that collaborative learning in practice epitomizes a major shift away from the distinctive teacher-centered or the lecture-centered situation to more student-centered situation. Although, this does not imply that the lecturing, listening, and the note taking process will vanish in its entirety.
Dillenbourg (1999a) described collaborative learning as a situation in which two or more people learn or attempt to learn something together. He further explained that each element in the definition could be viewed, described or interpreted in three ways:

1. “Two or more” may be interpreted as a pair, a small group (3-5 subjects), a class (20-30 subjects), a community (a few hundreds or thousands of people), and a society (several thousands or millions of people)... and all intermediate levels.

2. “Learn something” may be interpreted as “follow a course”, “study course material”, “perform learning activities such as problem solving”, “learn from lifelong work practice”, ....

3. “Together” may be interpreted as different forms of interaction: face-to-face or computer-mediated, synchronous or not, frequent in time or not, whether it is a truly joint effort or whether the labor is divided in a systematic way.

In other words, Lipponen, Panitz, Rochelle and Teasley’s definition of CL is synonymous to that of Dillenbourg. On the one hand, Lipponen, Hakkarainen, and Paavola (2004) stated that collaboration should be perceived, understood and viewed in three perspectives: acquisition, participation and knowledge creation. In the participation perspective, Lipponen (2002) describes collaboration as a process of participating in knowledge communities. Bruffee (1993) on the other hand describe collaboration as a process that helps a student’s become a member of a knowledge community whose common property is different from the property of the community they already they come from. He further explained that Collaborative learning provides a social context in which students can experience and practice the kinds of conversation valued by college teachers. Golub (1988) stressed that collaborative learning inhibits a core feature whose structure allows for student talk: students are supposed to talk with one another during various classroom activities and learning arises due to this talking.

Furthermore, collaboration in the knowledge building perspective can be considered as a process mediated by shared objects on which the participants are working (Hakkarainen, & Paavola, 2003). Hakkarainen and Paavola (2009) further explained that the “shared objects” that are in the process of being developed occurs by way of interaction. These objects of inquiry can be knowledge artefacts, practices, ideas, models, representations, etc. but understood as something concrete to be developed collaboratively.

Clark (1996) stated that collaboration is not to be confused with cooperation, which has many individuals work on a joint project but divide-and-conquer the subtasks that compose it. Collaboration is the process of interaction amongst people who share the same goal.
Crook (1996) stated that collaborative experience entails equal level of expertise among participants and the process of socio-cultural demands of internalization appears to infer that peer interaction must be approached as something less symmetrical: kind of peer tutoring. He further stressed that there is a progressive line from children’s secondary inter-subjectivity and symbolic play to sophisticated reciprocal understanding and shared knowledge. The material world plays a fundamental role in organization of play activities and in creating a shared framework for collaboration in children’s symbolic play. Therefore, most theories or approaches to collaboration pay less attention to the effect and possibilities of the material world for facilitating mutual understanding and shared goals. Furthermore, managing the material of the material world offers rich referential anchors for monitoring grounding and mutual understanding (Lipponen, 2002).

Collaborative learning materializes from the learner’s action while working with one another. Therefore, for collaborative learning success students must exhibit the willingness to listen to, and discuss other students’ ideas and suggestions and disseminate them into further actions, such as directions on how to progress with the task at hand (Beatty & Nunan, 2004). In addition, Barron (2003) indicates that successful collaborative groups need to repeat and engage in ideas of others by completing each other’s contributions rather ignoring or rejecting it. This implies that learning manifest in through students question expression, following lines of inquiry together, teaching each other, and seeing how others are learning (Stahl, Koschmann, & Suthers, 2006). Therefore, collaborative learning is fundamentally a social activity (Naismith, Pilkington, Lee, & Weeden, 2007).

Crook (1998) stated that for a successful collaboration there should be three central features of interaction: intimacy and scope of shared knowledge among participants, rich supply of externalized resources, such as computers, and histories of joint activity of those interacting. In other words, through the process of a collaborative learning activities, student do not react solely in isolation to the disseminated course materials but rather interact with one another over the materials (Stahl et al., 2006).

2.2 Computer-Supported Collaborative Learning (CSCL)

Research work on collaborative learning is predominantly focused on what manner individual functions in a group and under what situation collaborative learning was more effective than individual learning. In recent times, the focus has shifted from simply looking at cognition as only a “product” of individual information processors, and the context of the interaction as only a “background” for the
activity, to that where the group itself, and its collaborative efforts, is the unit of analysis (Dillenbourg, 1999b).

In recent years, computer-supported collaborative learning (CSCL) have continued to retain its dynamic state in the international research field focusing on how technology can promote design, creation & reflection and sharing of knowledge and expertise by means of peer group interaction and group learning process. Furthermore, computer-supported collaborative learning is one of the most promising concepts to improve teaching and learning with the help of modern information and communication technology which is another framework for this project.

Crook (1994) has stated that in the late eighties most experiments on computer-supported learning processes were supposed to be the crucial feature of computers. This was especially true for programmed instruction principles which are being applied in CAI programs, but the emphasis of individualistic models was also distinctive of many learning environments designed agreeing to constructivist principles. However, the capacity to combine these two concepts, computer-support and collaborative learning to effectively enhance learning remains a challenge that CSCL is intend to address.

According to Lipponen (2002) computer-supported collaborative learning (CSCL) is a paradigm that focuses on how collaborative learning which is supported by technology that augment students peer interaction and group work, and how collaboration and technology assists sharing and distribution of knowledge and expertise among community members.

Koschmann (2002) stated that CSCL is a field of study centrally concerned with meaning and practices of meaning-making in the context of joint activity, and the ways in which these practices are mediated through designed artefacts. Furthermore, CSCL exhibits two components which are analytic and design, where analysis of meaning making is indifferent to reform goals but strive only to learn what people are doing in every moment-to moment interaction without prescription or assessment (Stahl et al., 2006). And on the other hand where design is naturally prescriptive that is any attempts toward alteration begins from the presumption that there are other better or worse way to doing things. In other words, meaning and practices of meaning-making in the context of joint activity is synonymous to both intersubjective learning (Suthers, 2006) and a group cognition (Stahl, 2006). In addition, Stahl (2011) further stressed that students in group participation in cognitive experience could amount be a powerful way to teach them.
Stahl (2006) also pointed out that small groups is the avenue where productive intersubjective meaning-making could be observable because this is the arena where groups of members allow full fledged range of social interactions occurrence and where methods for learning intersubjectivity can be. In addition, the shared construction of meaning making in the context of joint activity is utmost visible and available for research at a small group unit of analysis, where it appears as a group cognition (Stahl et al., 2006). Furthermore, in the field of computer-supported collaborative learning the provision of a situation for joint activities that are supported by computing technology is considered to nurture learning through interactive processes in which participants naturally articulate, make sense and build upon each other’s perspectives (Stahl, 2006).

Therefore, CSCL is not to be mixed up with e-learning, which relies too much on the inexperienced belief that digitizing and disseminating course materials to a large number of students will encourage learning and better support teaching (Stahl et al., 2006).

2.3 Collaborative Interaction (CI)

Collaborative studies in recent years have focused on the interaction processes in collaborative situations, more precisely as it is associated to aiming for higher achievement among all collaborators (Dillenbourg & Traum, 2006). Dillenbourg (1999a) stated that in a collaborative situation, participation is expected to be symmetrical. In other words, students’ participation is the intervention in a collaborative environment. When it develops, the potential of sharing learning also raises (Negrón, Vera, & de Antonio Jiménez, 2010).

Puntambekar (2006) stated that one of the most important aspects of collaborative learning is the interaction between individual and collaborative learning activities – the differing viewpoints and shared knowledge building. Therefore, the differing viewpoints brought into a collaborative environment by individuals has remained acknowledged as having a major effect on collaborative interactions (Stahl, 2013). Furthermore, Puntambekar (2006) stressed that another facet of collaborative learning is its move from ostensibly divergent viewpoints to collaborative knowledge building. He further explained that this is because it is a social process among group members where various strategies are adopted for resolution of difference which involves emphasizing dominance, agreeing, and other forms of shared sense making. Furthermore, another significant aspect of collaborative learning is the transfer from knowledge assimilation to knowledge construction (Schwartz, 1999) i.e. knowledge construction in individual occurs through generative and physical activities. That said, the change from divergence
viewpoint to collaborative knowledge building to perhaps construction is important in understanding
the nature of collaborative interaction (Puntambekar, 2006).

In addition, collaborative interaction may be categorized in terms of time and space respectively (Johansen, 1988). The time for example means both the synchronous and the asynchronous phase, while the space is the collocated and the remote phase. Dodds (2009) stated that real life or “face-to-face” collaboration occurs at the same time and in the place which is synchronous and collocated. He further explained that technology in itself expands the potentials to embrace remote collaboration.

Asynchronous collaboration happens in the same place or in different place for example communication by leaving post-it note in a shared office and using email, voice mail, or a wiki (Dodds, 2009). Synchronous collaboration exhibits different types of communication which it provides for people. Therefore, face-to-face communication which is a type of synchronous communication comprises of eye contact, body language, verbal and multiple channel of communication for example talking to one’s neighbor vs. addressing the group as a whole (Dodds, 2009). Furthermore, people can support their communication with tools such as whiteboards, flipcharts, or digital technology.

That said, asynchronous interaction leads to prolonged communication times and synchronous communication tools like voice/text chat, video or even an online whiteboard are a better option.

Table 1. *Taxonomy of collaborative interactions in terms of time and space* (Johansen, 1988)

<table>
<thead>
<tr>
<th>Place</th>
<th>Synchronous</th>
<th>Time</th>
<th>asynchronous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collocated</td>
<td>Face-to-face Interaction</td>
<td>Leaving notes/massages in a shared offices: post-in notes, Whiteboard; someone passing one messages on others behalf</td>
<td></td>
</tr>
<tr>
<td>Remote</td>
<td>• Telephone;</td>
<td>• Email;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Video conferencing;</td>
<td>• Voicemail;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Chat/social systems (e.g. Second Life);</td>
<td>• Newsgroup;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Online games;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Collaborative Visualization</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3 AIM OF STUDY

The general aim of this study is to annex deeper understanding of collaborative learning interaction among pupil’s using Kodu Game Lab. Therefore, in order to achieve an efficient and constructive collaborative learning setting there is a need for interaction among group members. An investigation was carried out to examine the following focusing on two research questions:

– How do pupils interact with their peers when using Kodu game lab?
– How do the pupils interact with the teacher when using Kodu game lab?
4 METHODOLOGY

In this section, context and tools used in the study and the general procedure adopted for data collection would be described. Furthermore, data analysis of the study will be discussed in detail. Finally, the implication, limitation and the ethical issues will be described.

4.1 Context

The purpose of this case study is to examine student-student interaction and teacher-student interaction when using the Kodu Game Lab in Patamäki primary school. The school is a part of Maikkula comprehensive school in the city of Oulu, Finland. The participants of my study were seven 9 year old pupils (5 males and 2 females) from which five pupils’ were selected for intensive observation. Furthermore, before the pupils started the creation of their game, instructions were given to them on how to go about creating one of the games. Pupils participated in the lesson using the Kodu Game Lab to create their own games. The lessons consisted of three activities. Each activity was videotaped and recordings were analyzed by qualitative content analysis.

4.2 Tool (Kodu)

Kodu Game Lab (see Figure 1) is visual programming language specifically designed for creating games (Microsoft, 2014). Kodu Game Lab is a tiny visual programming tool (M. MacLaurin, 2009; Meerbaum-Salant, Armoni, & Ben-Ari, 2013), which allows users to create and play video games (Stolee & Fristoe, 2011). The Kodu Game Lab contains main bits for example; the graphical user interface design in an isometric 3D scene editor for laying out the game world, the new visual programming system that allows the creation of unique game behavior in an interactive manner, and a sharing system for swapping worlds over the Xbox Live. In addition, the Kodu Game Lab looks similar to the well-known commercial video games developed for younger audience. Furthermore, the Kodu Game Lab not only uses the key board and mouse for games creation but also employ the use of the Xbox 360 controller to make it more fun for the younger audience.
The Kodu Game Lab user can programme each characters (e.g. fish, cycle, apple, and tree) of the Kodu Game Lab individually, and the programming defines how each characters interacts with the world, much like an intelligent agent (Stolee & Fristoe, 2011). Furthermore, due to the gaming development environment, it comprises of terrain editor, lay out tools, character menus, and other mechanism which allows end-user to create as many characters as possible with each assign with a rule on what to do in the created world.

Similarly, the Kodu Game Lab runtime contain collections of fundamental game technology e.g. camera controls, collision detection, and physics (M. B. MacLaurin, 2011). All this components available in the Kodu Game Lab are elements of the Game which the students and teacher are familiar with.

### 4.3 Data Collection

The observation was done between December 2013 and January 2014. All the three game sessions were videotaped by the researcher who followed the players (pupils’) and videotaped the action. Pupils were observed creating different types of games such as word game, dalton brothers and arithmetic game with the Kodu Game Lab in collocated scene with two pupils each assign with a computer. The duration of the observation varied from 30 minutes to 45minutes. The observation were recorded by using a video recording device. The total amount of video data collected from the groups’ play was 3
hours and 30 minutes, which resulted in 50 shots of coded non-verbal activities. Permission for the recordings and for the use of the observations were asked and received from all the participants.

4.4 Data Analysis

The data analyses focus on the nonverbal interaction which occurred in the selected activities of the pupils’ engaged when using the Kodu Game Lab. This study employs the qualitative research methodology. More precisely, qualitative content analysis (QCA) was the exact method used in the research. Therefore, content analysis process involves coding raw message (i.e. textual material, visual images, illustrations) in accordance to a classification scheme (Kondracki, Wellman, & Amundson, 2002). Furthermore, qualitative content analysis is for making a replicable and valid inferences from data to their context, with the drive of providing knowledge, new understanding, a representation of facts and a practical guide to action (Klaus, 1980). The choice of making video recordings as a means to collect data concurs with the characteristic of the study.

Firstly, in order to make data analysis easier, codes were assigned to groups and pupils’. The first group (G1) were composed of two girls (Pupil1 and Pupil 2) and the second group (G2) were composed of three boys (Pupil3, Pupil4 and Pupil5) and the third group (G3) was composed of the teacher (T) and the pupils’ from the second group (Pupil3, Pupil4 and Pupil5) respectively.

Secondly, the video recordings were viewed thoroughly and snap-shot of every non-verbal information were taken, in order to make clear outline of the interaction that occurred within each group. The non-verbal information snap-shot obtained from the video data for each group during different activities were coded in line with the non-verbal communication cues useful to foster collaborative interaction such as gaze, facial expression (e.g. smile and frown) and gesture (e.g. hand pointing, waving, and using finger to indicate numeric amount). The coding was designed in a qualitative data analysis software known as HyperResearch. Furthermore, interaction were categorized in this study in three levels based on the number of times each nonverbal cues within an activity occurs which were high, medium and low level. The table below demonstrates facet of coding frames used in this study.
Table 2. Level of interaction

<table>
<thead>
<tr>
<th>Level of Interaction</th>
<th>Nonverbal Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Gaze, gestures and facial expressions</td>
</tr>
<tr>
<td>Medium</td>
<td>Facial expressions &amp; gaze or gestures &amp; gaze or facial expressions &amp; gestures</td>
</tr>
<tr>
<td>Low</td>
<td>Facial expressions or gaze or gestures</td>
</tr>
</tbody>
</table>

*Gaze*: when people are engaged on a task, gazes serve as a means of information collection. Through gazes people get feedback about contact, perception, understanding and attitudinal reactions (Schemas, 2001). Therefore, gaze is an exceptional judge of conversational attention in multiparty conversations (Argyle & Dean, 1965). In other words, via pupils’ gazes it can be determined if they are paying attention to the current task or to their peers.

*Facial expressions*: when pupils’ engage in task and conveys information and get feedback through smile and frown.

*Gestures*: are often perceived as evidence that the body is involved in thinking and speaking about the ideas expressed in those gestures (Alibali & Nathan, 2012). Therefore, pupils’ engagement in task could result to their deliberate movements and signals to communicate meaning without words. This are hand pointing, waving and using finger to indicate numeric amount.
5 RESULTS

This study examined the various nonverbal interactions that occur during the selected activities in attempt to answer the research questions. In order to make the results meaningful, tables with nonverbal interactions were created for all the cases and frequencies of their occurrence were shown. The findings are presented in each of the three activities.

5.1 Activity 1: Dalton Brothers

The activity began by the teacher T1 explained what to do to the pupils’ in each group in order to promote interaction. He further demonstrated by the use of nonverbal expressions to communicate with the pupils’.

Group 1.

P1 describes what to do to P2 by using gestures (hand pointing) on the Game Lab while P2 gazed to indicate her attention on the task. P1 have an eye contact with P2 to indicate that P1 attention is on the task. P2 described to P1 twice by using gestures (hand pointing) on what icon to pick on the Kodu Game Lab. P1 gazed (eye contact) at P2 four times to indicate that P1 attention is on the task and P2 gazed (eye contact) at P1 to indicate her attention on the task. P2 made a facial expression (smile) when listening to P1 to indicate that P2 likes the task while P1 made a facial expression (smile) when listening to P2 to indicate that P1 likes the task. During this activity a total of 13 segments of nonverbal interaction were recognized. Furthermore, the nonverbal behaviour that mostly occurred were the gaze with 8 gazes while there were 3 gestures (hand pointing) and 2 facial expression. Therefore, the interaction level found according to the theory were medium and low. The table 3 shows the rules according to the theory.
When testing the theory on the level of interaction that occurred on Case: Group 1 the following rules were found to apply to this case

<table>
<thead>
<tr>
<th>Rule</th>
<th>Condition</th>
<th>Level of Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rule 2</td>
<td>IF pointing hand AND gaze OR frown AND smile OR pointing hand AND smile OR gaze AND frown OR gaze AND smile OR pointing hand AND frown</td>
<td>Medium Level Interaction</td>
</tr>
<tr>
<td>Rule 3</td>
<td>IF frown OR smile OR gaze OR pointing hand</td>
<td>Low Level Interaction</td>
</tr>
</tbody>
</table>

5.2 Activity 2: Word game:

The activity began by the teacher T1 explained what to do to the pupils’ in each group in order to promote interaction. He further demonstrated by the use of nonverbal expressions to communicate with the pupils’

Group 2.
P4 described to P3 and P5 by using gesture (pointing) on where to move the Kodu avatar. P3 described to P4 and P5 by using gesture (pointing) six times on how they will code Kodu avatar’s movement from a point to another. P4 described to P3 and P5 by using gesture (pointing) on what word the Kodu avatar will display after coding. P5 described to P3 & P4 by using gesture (pointing) seven times to the different terrains needed. P5 made a facial expression twice when listening to P3 to indicate that P5 dislikes the task. P4 had eye contact five times with P3 & P5 to indicate that P4 attention is on the task. P3 had eye contact five time with P4 and P5 to indicate that P3 attention is on the task. P5 had eye contact six times with P3 & P4 to indicate that P5 attention is on the task. P5 having eye contact with P3 & P4 to indicate that P5 attention is on the task. During this activity a total of 39 segments of nonverbal interaction were recognized. Furthermore, the nonverbal behaviour that frequently occurred were the gesture 15, the gaze 16 and the facial expression 8. Therefore, the interaction level found according to the theory were of high, medium, and low in this group. The table 3 shows the rule according to the theory.

### Table 4. Levels of interaction

<table>
<thead>
<tr>
<th>When testing the theory on the level of interaction that occurred on Case: Group 2 the following rules were found to apply to this case</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rule 1</strong> was applicable:</td>
</tr>
<tr>
<td>IF gaze AND pointing hand AND frown AND smile</td>
</tr>
<tr>
<td>THEN GOAL REACHED High Level Interaction</td>
</tr>
<tr>
<td><strong>Rule 2</strong> was applicable:</td>
</tr>
<tr>
<td>IF pointing hand AND gaze OR frown AND smile OR pointing hand AND smile OR gaze AND frown OR gaze AND smile OR pointing hand AND frown</td>
</tr>
<tr>
<td>THEN GOAL REACHED Medium Level Interaction</td>
</tr>
<tr>
<td><strong>Rule 3</strong> was applicable:</td>
</tr>
<tr>
<td>IF frown OR smile OR gaze OR pointing hand</td>
</tr>
<tr>
<td>THEN GOAL REACHED Low Level Interaction</td>
</tr>
</tbody>
</table>
5.3 Activity 3: Arithmetic Game

In this activity the second group (P3, P4 and P5) were the only group that participated in the activity which involves the teacher (T) throughout the activity.

Group 3.

T described to P4 by using gesture (pointing) while P3 and P5 pays attention to the task. T described using gesture (pointing) how to make the Kodu avatar move to pick apples to P3, P4 and P5 while they gazed to indicate their attention on the task. T described using gesture (pointing) how to make the Kodu avatar move to pick apples to accrue points to P3, P4 and P5. T described using gesture (pointing) how to code Kodu avatar move to pick apples to P3, P4 and P5. T described using gesture (pointing) how to code the apples with numbers to P3, P4 and P5. T described using gesture (pointing) how the numbers assigned to the apples can be placed in descending order to P3, P4 and P5 while they gazed to indicate their attention on the task. T made eye contact with the P4 four times while explaining to get P4’s attention. T made eye contact with the P5 five times while explaining to draw P5’s attention to the task. T made eye contact with the P3 five times while explaining to draw P3’s attention to the task. During this activity a total of 22 segments of nonverbal interaction were recognized. Furthermore, the nonverbal behaviour that mostly occurred were the gaze with 14 gazes while there were 8 gestures (hand pointing) and 0 facial expression. Therefore, the inter-
action level found according to the theory were medium and low. The table 5 shows the rules according to the theory.

Table 5. Levels of interaction

<table>
<thead>
<tr>
<th>When testing the theory on the level of interaction that occurred on Case: Group 3 the following rules were found to apply to this case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rule 2 was applicable:</td>
</tr>
<tr>
<td>IF pointing hand AND gaze OR frown AND smile OR pointing hand AND smile OR gaze AND frown OR gaze AND smile OR pointing hand AND frown</td>
</tr>
<tr>
<td>THEN GOAL REACHED Medium Level Interaction</td>
</tr>
<tr>
<td>Rule 3 was applicable:</td>
</tr>
<tr>
<td>IF frown OR smile OR gaze OR pointing hand</td>
</tr>
<tr>
<td>THEN GOAL REACHED Low Level Interaction</td>
</tr>
</tbody>
</table>

5.4 Frequency of Interaction

This section shows the frequency of nonverbal interaction (nonverbal cues) which occurred in the groups. The fig. 2 shows the nonverbal interaction that occurred in each groups and the level of interaction of each group.
Firstly, Group 1 shows that the nonverbal interaction occurrence is at both the medium and low level interaction due to the rule 2 and rule 3 which states that if the presence of “facial expression AND gaze OR gesture AND gaze OR facial expression AND gesture (hand pointing) is seen or occurs the goal reached is medium level interaction” and “IF facial expression OR gaze OR gesture (hand pointing) then goal reached is low level interaction”. This were the case to Group 1.

Secondly, Group 2 in the chart shows that nonverbal interaction level occurrence agrees with the rule 1, rule 2, and rule 3 which states that the if the presence of “gaze AND gesture (hand pointing) AND facial expressions (smile and frown) is seen or occurs the goal reached is high level interaction”, facial expression AND gaze OR gesture AND gaze OR facial expression AND gesture (hand pointing) is seen or occurs the goal reached is medium level interaction” and “IF facial expression OR gaze OR pointing hand then goal reached is low level interaction”.

Thirdly, Group 3 shows that the nonverbal interaction occurrence is at both the medium and low level interaction due to the rule 2 and rule 3 which states that if the presence of “facial expression AND gaze OR gesture AND gaze OR facial expression AND gesture (hand pointing) is seen or occurs the goal reached is medium level interaction” and “IF facial expression OR gaze OR pointing hand then goal reached is low level interaction”
Figure 2. Frequency of nonverbal interaction
6 DISCUSSION

The focus of the study was to analyse in detail how Kodu Game Lab could be used to foster quality teaching-learning process for pupils in primary schools. Specifically, I was interested in the collaborative interaction that occurred between pupils’ and their peers and collaborative interaction between pupils’ and teachers using Kodu Game Lab. The data was collected from a Kodu class through video recording and this was chosen as the central data.

The theoretical framework of this study comprised of three aspects. Firstly, collaborative learning as a situation in which two or more people learn or attempt to learn something together (Dillenbourg, 1999a). Secondly, computer-supported collaborative learning (CSCL) which is how collaborative learning that is supported by technology that augment students peer interaction and group work, and how collaboration and technology assists sharing and distribution of knowledge and expertise among community members (Lipponen, 2002). Thirdly, collaborative interaction categorized in terms of time and space (Johansen, 1988) i.e. synchronous or asynchronous.

The data analyses was done by categorization through the method of qualitative content analysis. Firstly, I concentrated on looking at the nonverbal behaviours that occurred during the game play by the pupils’ and categorized three levels of interaction, the high, medium, and low level interaction. The categorization was made based on the sequence of interaction occurrence in each frames. Those frames in which at least three nonverbal cues (facial expression, gaze and gesture) were used within the group were coded as High Level Interaction. Secondly, frames where there were at least two nonverbal cues used were coded as Medium Level Interaction. And thirdly, frames where at least one nonverbal cues used were coded Low Level Interaction.

The result show that one of the group had High, Medium, and Low Level of Interaction while other (two groups) exhibit Medium and Low Level Interaction. Furthermore, the findings shows that pupils’ interaction with their peers while using Kodu Game Lab through the use of nonverbal cue results to High, Medium, and Low Level Interaction within group two. On the one hand, pupils’ interaction with the teacher while using Kodu Game Lab through the use of nonverbal cues results is Medium and Low level within group one and group three respectively. Also, the results show that pupils’ interact more with their peers than they do with their teacher when using the Kodu Game Lab because of their bond as children and trust in each other through their combined faith and understanding of that social world in which they share (Aschermann, 2001). Similarly, children communicate both verbally and nonverbally their thoughts and understanding at a level that is eventually understood by all of them in-
involved (Göncü, 1993). In addition, children understand, arrange, and use information from the environment, and use the knowledge they gain from these actions to acquire skills and knowledge. As they discover a world that is full of meaning through interactions with their peers, they help to shape and share in their own developmental experiences (Aschermann, 2001).

On the other hand, the teacher interaction with pupils is less according to Hartup (1992) peers’ interaction is different from those they have with adults because of their egalitarian status.

Furthermore, the result shows how successful collaborative interaction in the teaching-learning process through the use of non-verbal cues between pupils to pupils due to the understanding they had development amongst themselves. This understanding found in peer to peers interaction could be used or introduced to make interaction between teachers to pupils successful in the same way as the pupils to pupils’ interaction.

### 6.1 Limitations

Firstly, data collected was through observation of nonverbal communication cues only. Therefore, the results are based on the researchers’ personal assessment and judgment about pupils’ work and behavior. Secondly, as far as the limitation of the analyses some qualitative methods, such as observation (verbal communication cues) and transcription could give more reliable results on this kind of research. However, it was not possible in the scope of this study due to the short period.

### 6.2 Ethical issues

The data collection was designed in such a way that the participants remain anonymous. The names of the pupils are not mentioned in this study and therefore it will not be possible to identify the participants. The participants consent were sort through their parents and the will of the participant were also taken into consideration.
7 CONCLUSION

In today’s world, the medium of learning has been revolutionised from the conventional way into a sophisticated one to meet up to the standard of 21st century learning skill. This is as a result of the emergence of the new participatory culture which according to Jenkins (2009) calls the new media literacies which is a set of cultural competencies and social skills that young people need in the new media landscape.

The results of this study show skills such as play, performance, simulation appropriation, multitasking, distributed cognition, negotiation, and collective intelligence e.t.c. these are the 21st century skills.

Furthermore, the research aimed to annex deeper understanding of collaborative learning interaction among pupil’s using Kodu Game Lab through the lens of nonverbal interaction that occurred within the groups.

In addition, the result show that pupils’ use Kodu Game Lab to interact with their peers and the interaction level of pupils’ with their peers is of High, Medium, and Low Level when engaged in a given task. However, pupils’ interaction level with their teachers is of Medium and Low Level when engaged in a given task. Therefore, these show that pupils’ interact more with their peers than they do with their teacher when using the Kodu Game Lab.

Furthermore, this result would assist in understanding how Kodu Game Lab could be used to foster teaching-learning situations in primary schools. In addition, the results may be a procedure in increasing and crafting more creative models and policies for collaboration and collaborative Interaction both in educational contexts and non-formal context. More so, understanding the use of Kodu Game Lab in fostering teaching-learning process and how it ensue in order to achieve results give room to helping in the development of the community towards more successful and resourceful collaboration.

In future, it would be interesting to do further study on how both verbal and nonverbal cues could be retrieved from collaboration with the aim of fostering of collaborative interaction between pupils’-pupils’ and teacher-pupils’. Similarly, this insight provided by the current research findings shed light only on nonverbal cues seen in a game play and there is the need to know about the influence of both verbal and nonverbal cues in pupils’ interaction process with peers and with their teachers.
8 References


Smith, B. L., & MacGregor, J. T. (1992). What is collaborative learning?


APPENDIX 1

The Kodu Game Lab has a *Main Menu* that provides seven options which are the *menus*. This *menus* are resume, new world, load world, community, options, help, and quit Kodu. The *load world*, *community*, and *options menu* contains sub-menus within them. Furthermore, the *load world* and the *community menu* contains the *Built-in Worlds* which is among the Kodu Game Lab component that allows users to get started quickly. This comes in three types: Sample game, tutorials, and Techniques. The *sample games* are the mini default games that are unfinished, playable and also editable which provides ideas on how to start for users, on the one hand, *tutorials* are the comprehensively games designed to teach users how to design games and more specifically the programming aspect of the Kodu Game Lab, and on the other hand, the *techniques* are the simple worlds that demonstrate the useful behavior of the Kodu Game Lab for example like the jumping when a particular terrain type is touched or automatic chasing of colors. Another important feature of the Kodu Game Lab is also the *tool palette*, which holds all the main editing tools. The *tool palette* consist of the *run tool* and the *object tools* respectively. The *run tool* is used to control or play already created game on the Kodu Game Lab while the object tools is used to choose the type of character, terrain needed to create a personal game on the Kodu Game Lab.
Figure 3. *Kodu Game Lab Main Menu*
Figure 4. *Kodu Game Lab Tool palette*
Figure 5. Kodu Game Lab Load world
Figure 6. *Kodu Game Lab Sample world*