

An Investigation of the Use of Facebook Groups as a Learning Management System to Improve Undergraduate Performance

R.A. Jones and S.A. Bogle, *Member, IAENG*

Abstract—This study investigates the use of Facebook as a Learning Management System on junior and senior students doing multimedia-based courses. The study uses a conceptual model based on the second thesis of Anderson's Interactivity Equivalency Equation to ascertain the impact the use of the technology has on student learning outcomes. Results showed that the most significant factor of interaction was the student to teacher construct. Due to their interaction on the social media site group with their peers, content and teacher, they achieved higher final results. Significant factors were the value placed on real-time chatting with peers, practical assessment on overall learning and the reading of instructor posts. 75% of the control group had GPA less than 2.70, which suggest that the lack of the additional interaction may have been a contributing factor to lower GPAs than the experimental group which had a mean GPA of 3.71.

Index Terms—Developing Country, Educational Technology, Jamaica, Social groups, Learning Management Systems, Social Networking

I. INTRODUCTION

THE emergence of Internet-based Social Media Technologies (SMT) also called Social Networking Sites (SNS) such as Facebook, has made it possible for one person to communicate with several hundreds or even thousands of other people about anything, whether it is a product, service, company or ideas [1]. As popular as these technologies are among students of higher education, they usually aren't proposed as a learning platform by faculty, for delivering course curriculum, especially in developing countries; they are rather stigmatized as a form of technology that detracts from academic learning and are sometimes banned from use within the tertiary education computer network domain. It has also been purported to have a "well established trend toward the non-adoption of new technologies"[2][3][4].

Research has shown that the use of Social Media Technology can improve the learning outcomes and academic performance among students of higher learning by providing a more familiar environment online, that is directed at higher learning education [2][4][5]. The goal of

the work within this study is to develop a non-traditional learning environment that fosters not only a sociable class setting but also promotes student centered learning and discussions that extend beyond the classroom hours and boosts academic performance.

A. Background

The island of Jamaica, a developing country, is home to 2.729 million people and has five universities and several colleges nationwide each with varying courses and learning methodologies [6].

The use of Social media has had an explosive growth since their inception. Facebook, the fastest growing Social Media Site reported 58 million users in 2007, in 2016 it reported having over 1.6 billion active users with 91% of them being inclusively mobile users [7] which account for the predominant use of mobile devices among undergraduate students.

The average college student spends approximately 16.13 hours per week on Social Networking, especially on Facebook [8][9].

For this study, multimedia and animation majors participated in a blended mode of delivery where the instructor used Facebook Groups as a Learning Environment and reported higher results in motivation and participation. A framework making use of the second thesis of Anderson's Interactivity Equivalency Equation was conceptualized in order to investigate the major influences of motivation towards learning and why this phenomenon occurred with students who were more active in classes while using the created Facebook Groups, SCIT-Multimedia Studio and SCIT Animation Studio[10][11][12][13].

The predominant method of teaching and interacting with students in higher education takes place in a classroom setting with the instructor giving a lecture to the students or creating case scenarios where students can interact with each other and the instructor by participating in group activities such as discussions and quizzes. In some cases, classes are supplemented by the use of the Learning Management System, MOODLE[14][15][16].

B. Contribution

Very few studies have explored the use of Facebook as an alternative means of creating a collaborative learning environment that is managed by the instructor. Secondly, there has been very little formal research done on the use

Manuscript received June 12, 2017; revised August 20, 2017. Rushane A. Jones is an MPhil Candidate at University of Technology, Jamaica 237 Old Hope Road, Kingston 6 (corresponding author phone: 876-927-1980; e-mail: rushane.jones@utech.edu.jm).

Dr Sherrene A Bogle is a senior lecturer at the University of Technology, Jamaica 237 Old Hope Road, Kingston 6; e-mail: sbogle@utech.edu.jm).

and implementation of Social Media and Higher Education in the context for a developing country. Thirdly, it is helpful to determine the specific association among social media, learning environment and academic performance. To address the aforementioned gap in the literature, *this paper will show how the Interaction Equivalency Theory can be used to explain and predict academic performance in university students who do practical courses*. This study utilizes SMT as a non intrusive learning environment for students and peer collaboration, in order to improve student learning outcomes, and further challenges the way curricula are delivered in higher education.

II. LITERATURE REVIEW

This section of the paper discusses related studies that point to the gap as well as the theoretical frameworks used in the study.

A. E-Learning, Instructional Technologies and Learning Management System

According to [17], e-learning should have, “some transformation of an individual's experience into the individual's knowledge through the knowledge construction process.” It was argued that there must be some level of interactivity in it as well.

In [18], a study was conducted to investigate how students interact within the context of a LMS without the mediation of an instructor. The results of the study concluded that students found their way around the LMS but there was little evidence of knowledge construction. The author suggested that the LMS designers consider literature on computer-supported collaborative learning environments in order to facilitate independent group projects with the LMS.

Reference [19] discussed whether social media sites (SMS) could be used as a LMS and makes a comparison, outlining the criteria of a proper LMS and noting the advantages and shortfalls of the SNS in comparison to the LMS. It also mentioned the features of the LMS which made it a viable technology in education

The LMS has become an integral part of the educational system in most universities and interest has continued to grow in combining the traditional teaching methodologies with online activities to create blended modes of teaching [20].

B. Social Media in Education

Social Media sites have become dominant for education and entertainment. As humans we are akin in forming communication with people of similar interests. In education, there are primarily two trains of thought prevailing when it comes to social media in education. The first outlook is that they can have a positive impact on activities deemed important by all stakeholders in education institution and the second is that they have a bad influence on student performance and inflicts poor behavior and time management in students.

Reference [21] explained that social media has become a growing phenomenon with many varied definitions in public and academic use. While the use of Social Media had

proliferated into many fields of conduct, very little was seen in the use of post-secondary contexts such as student engagement, learning and recruitment.

Reference [22] stated emphatically, that students who use Facebook during periods of study are under performing in comparison to those who do not use social media. The research concluded that non-Facebook users tended to academically outperform their counterparts by gaining higher grade point averages in their school work and made a call to educational institutions to design ways of getting students to access their work on social media in order to minimize the failure rate for students who are highly engaged in Facebook.

In [23], the researcher expounds on the positive and negative influence that social networking sites have on student performance by looking at various research samples in both the university and the secondary school environments. ICT tools have been known to have a great impact on educational support. Using computers and the Internet have become quite important in both the teaching and learning processes, and with the increased use of mobile devices, students have become much easier to reach while utilizing such technology.

C. Facebook in Higher Education

A study conducted in a Vietnamese university concluded that students using social networking sites have substantially improved their grades. The improved grades were due to the Faculty's adoption of the SNS [23]. A study done on 161 Tunisian students concluded that performance improvement was based on students' satisfaction with their family and friend relations. Emphasis was placed on multitasking as a moderator of such actions, where multitasking and students' interest in the university would help to enhance performance based on Facebook use [24].

In a study done on the aspects of Social Media Learning, the researcher aimed to discuss the positive and negative impacts of social networks on undergraduate level. They reported seven studies conducted that concluded that they were known to adversely affect their performance at school. One of the seven studies however, said that the SNS can be useful for educators based on sound pedagogical principles and proper supervision by the teachers [25].

Reference [13] discussed an effort on the replacement of an LMS with Facebook Groups as a course website. The study not only pointed out the features that a LMS must possess to be successful, but also the academic opportunities it should have aimed to accomplish. Such outcomes included, providing a learning environment where the students are able to interact with the course content even without the instructor being present. Also, the environment should form interactions among the learners. Although the quality level of the interaction is not stated [26], it would have implicitly agreed that within the Distance Learning spectrum, such categories of interaction is necessary, according to Theses 1 and 2 of the Interaction Equivalency Theorem. The purpose of the interaction pointed towards increasing the motivation for learning, and creating mutual support for each other.

D. Theoretical Framework and Conceptual Model

The Interaction Equivalency Theorem that was proposed by [11] aims to clarify how interaction works in distance education. It proposes an argument that there is a difference in schemes between the independent versus interactive oriented distance learning activities and these need to be taken into consideration when designing and delivering

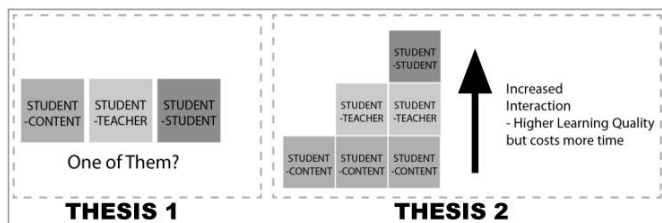


Figure 1 Interaction Equivalency Theorem

distance education that meets the needs of its learners in an efficient and effective way [27][28].

Figure 1 above, gives a visualization of the equivalency theorem. The main features of this framework can be condensed into two theses:

Thesis 1 states, “Deep and meaningful formal learning is supported as long as one of the three forms of interaction (student–teacher; student–student; student–content) is at a high level. The other two may be offered at minimal levels, or even eliminated, without degrading the educational experience [27, p94]”.

Thesis 2 states, “High levels of more than one of these three modes will likely provide a more satisfying educational experience, although these experiences may not be as cost or time effective as less interactive learning sequences [27, p94]”.

The first thesis is likely to be associated with a closed system, in which the level of interaction is preset and is consequently limited by the design, to ensure that there is effective and efficient learning. The second thesis is likely to be associated with an open system where there may be a positive surplus of the interaction could occur; such as a guest speaker or an impromptu field trip. It is not impossible for a course to be planned in such a manner that will provide high level of interaction in all three elements, however that will warrant the need for time and cost [28].

The conceptual model seen in Figure 2 is based on Thesis 2 of [11][27][28]. This model forms the framework for this study.

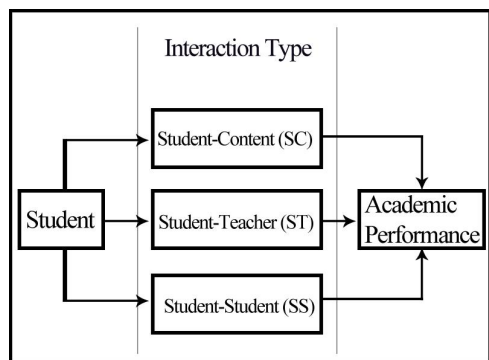


Figure 2 Conceptual Model based on Theses 2 of Interaction Equivalency Theorem

It was used in order to improve the academic performance of the students involved in the study. Based on the literature, three constructs, Student-Content Interaction (SC), Student-Teacher Interaction (ST), Student-Student (SS) in the Interaction Equivalency Theorem. The conceptual map shown in the figure above delineates how academic performance was affected in the study.

E. Summary

This section explained the literature behind the study, presented the gaps and delineated the conceptual framework used in the study.

III. METHODOLOGY

This case study used a mixed method experimental design approach utilizing both qualitative and quantitative methods. The research was conducted with a pragmatic approach [29].

A. Population and Target Sample

The sample for the case study was be taken from two (2) classes of students within multimedia and animation majors at the national university. The population of students at the institution is approximately 13,303 of which approximately 1,220 students attend the School of Computing and Information Technology(SCIT) where the study takes place, each occurrence of the module in the study was capped at a maximum of 25 students per session.

The participants of the study enrolled in the respective modules Digital Graphics and Animation Tools I which were offered in a blended method of teaching. This study was limited in scope to investigating interaction experiences and preferences of these learners in order to provide in-depth data about specific interactions with technology and how it affects their academic performance.

B. Sample Course Description

Students were taught in a blended mode of study and met with the instructor for at least four hours each week. A Facebook group was created to facilitate a majority of the communication for the class. Assignments, external resources and videos were posted on the group as content. During the class period, students were given activities pertaining to the lesson and also issued an in-class test to complete. All course content and assessments were submitted to the Facebook group. At the end of the semester, all assessments were collated to get the final results of the course.

C. Instrument

The instrument used in the study was an online survey distributed through social media and email in the form of a Google Forms questionnaire consisting of open ended and closed ended questions adopted from [19] and [26].

Based on Cronbach’s reliability analysis, 30 close-ended questions were used in order to meet a good standard

Table I
 Summary of Survey Instrument

Summary of Instrument			
Section	Items	Relates to	Item Labels
1	1 - 8	Demographic Information	
2	9-15	Student-Content	SC00, SC01, SC02, SC06, SC07, SC09, FB_SC01, ST04
3	16-23	Student-Student	FB_SS01, FB_SS02, SS01, FB_SS03, FB_SS04, FB_SS05, SS04
4	24-30	Student-Teacher	FB_ST01, FB_ST02, ST02, ST03, FB_ST03, FB_ST05, ST09

of reliability [30]. The questions gathered data on demographics and the SC, SS and ST constructs. The constructs were tested using 5-point likert system. The variables of Cronbach's Alpha analysis for the variables SC, SS and ST were 0.73, 0.83 and 0.70 respectively. Additionally there were a few open-ended questions to garner feedback of the students' experience.

D. Data Preparation and Analysis

A series of activities were performed on the data to ensure the maximum usability of the data for statistical analysis. Table I shows a summary of the instrument.

Each item in the questionnaire was given a variable name and the responses for each question were entered in the PSPP's data view. Each participant was given a unique identification number which was to identify their row in the data set. This facilitated easy modification of the data that had been misinterpreted, missing or entered incorrectly, and in some situations, the cases, had to be deleted. Using PSPP, a series of tests were done on the data, ANOVA and Pearson's Correlation Matrix, the findings were collated and are outlined in the next section.

E. Limitations

The researcher conducted the study on only two groups. The use of convenience sampling may have had a part to play in the correlation, however fails to give a causal relationship in the study. It should be stemmed from the first limitation, that although the invitation to participate was thrown out to all students in the two groups, only a small percentage replied. Among those received, a small fraction of the participants had not answered all the questions in the study and had to be excluded from the results of the already small data set.

IV. FINDINGS AND DISCUSSION

A. Response Rate

Among the Animation Tools I class of 17 students, the response rate was 59%, with a response from ten students.

Table II
 Description of significant variable in ANOVA in relation to Academic Performance

Variable Name	Description	Sig.
SC07	Value placed on practical assessments to overall learning	.000
FB_SS03	Value placed on real time chatting with classmates	.000
ST09	Value placed on reading posts from the instructor	.001

Among the 41 students of the Digital Graphics module, there was response rate of 26%, gaining a response from 11 students. In total, 21 students responded. Validity checks were made and only 20 surveys were used.

B. Descriptive Analysis

Below is the descriptive analysis of demographics of the participants. The ratio of male to female was 4:1, the age range of the participants were between 16 and 33. They had varying computer literacy levels but a majority of them had specialized skills with computing. None were aware of any other modules from delivered by Faculty that used Facebook as a LMS. The ratio of Animation Tools I to Digital Graphics was 1:1. With regards to if they had done a previous course of study, seven of them transferred from four different courses of study. For those coming from a different course of study, they attained different levels within their respective courses; three were freshmen, one was sophomore, two were junior, and one was senior.

C. Research Questions

Research Question 1: What is the relationship between social media interaction and academic performance?

Hypothesis 1: The three types of interactions would have an impact on the academic performance of the students.

Using Pearson's Correlation, it was found that there was a weak positive correlation between SC and AP of 0.2933. The correlation between SS and AP had a weak positive correlation of 0.232 and finally the correlation between ST and AP had a medium positive correlation of 0.4075. These show that the Student to Teacher interaction on Facebook had a greater impact on Academic performance, confirming the hypothesis.

Using ANOVA on the questions, there were some variables that were statistically significant in their values. SC07, FB_SS03, ST09. Table II above shows the description of the variables.

Research Question 2: What factors of social media interaction can affect academic performance?

Hypothesis: While there would be impact from all interactions, The Student-Teacher interactions would have the greatest impact on the students' academic performance.

Table III
Results of Academic Performance

Sample ID	Control (C) or Experimental (E)	Total Grade GPA	Lab Test %	Lecture Test %	Individual Assignment %
A	C	0.00	0	0	0
B	C	2.30	36	92	81.7
C	C	2.67	6	88	100
D	E	3.30	90	40	87
E	E	3.33	45	91	87.7
F	E	3.33	80	88	86.7
G	E	3.67	94	93.35	70
H	E	3.67	90	90.5	100
I	C	3.67	82	93.35	75
J	E	3.67	80	76.65	75
K	E	3.67	91	89	67.9
L	E	3.67	71	88	71
M	E	3.67	89	90.075	90
N	E	3.70	85	89	94
O	E	3.70	96	86	94
P	E	4.00	100	91.82	100
Q	E	4.00	100	85	100
R	E	4.00	85	90.17	100
S	E	4.00	96	83.635	92
T	E	4.00	100	85.715	85

According to the Interaction Equivalency Theses [27], a high level of one of the three interactions either exclusively or combined, SC, SS, ST can positively affect the performance of students. While the specific hypothesis of the researcher proved false, the overall hypothesis proved true. Students had benefited from the interactions in the system. The most significant values were with the interactions between students and content.

Research Question 3: How does faculty and students use social media currently and what percentage is used for boosting academic performance?

Hypothesis: Use of Social Media as a Learning environment for tertiary education students would be at a low level or virtually non-existent among the population.

When the participants were asked about their awareness of the level of activity that faculty had on social media and to list the examples they know, there were a variety of responses. On further investigation of the participants' responses, the social media accounts were not created by faculty, but by students within the faculty promoting communication across groups. Ninety percent were unaware as to whether or not their faculty had used social media.

D. Academic Performance

Table III shows the results of all 20 participants and their course GPAs. The three lowest grades were from the control group which did not utilize the additional interactions with peer, content and teacher available on the Facebook learning group. Three fourths of the control group had GPAs less than 2.70, which suggest that the lack of the additional interaction may have been a contributing factor to lower GPAs than the experimental group which had a mean GPA of 3.71. It is also notable that three-fourths of the control group had significantly low grades on the Lab Test of the

course assessments which could be derived from lack of interaction and resources from the online group.

V. CONCLUSION

There exists a weak positive correlation between Student-Content and Student-Student interactions. Student-Teacher however had a slightly higher correlation. This suggests that *increased use of Facebook Groups as LMS could improve academic performance among students.*

The majority of students in the sample transferred from diverse programmes in the university, from freshmen through senior years and were unaware of social media being used by faculty as a learning environment. Based on their responses, it was concluded that faculty primarily uses social media for promotions and alerts.

This study both answers the challenge concluded by reference [22] and proved that Facebook users can perform as well if not better than their counterparts. *When guided by faculty, Facebook can become a non-intrusive learning environment to being a part of norms of social media.*

If faculty should embrace these results, they could improve the activity and performance of their classes in a non-intrusive manner. This would allow students to not only focus on recreation and communication, but also participate in classroom activities and increase the amount of time students spend on their work through interactions with classmates, content and instructor. It is also anticipated that with the use of a larger sample using the Facebook Group, the correlations may increase.

REFERENCES

- [1] Mangold, W. G., & David J. Faulds. (2009). Social media: The new hybrid element of the promotion mix, (52), 357–365. <http://doi.org/10.1016/j.bushor.2009.03.002>
- [2] Roblyer, M.D., McDaniel, M., Webb, M., Herman, J., & Witty, J., (2010). Findings on Facebook in higher education: A comparison of college faculty and student uses and perceptions of social networking sites. *Internet and Higher Education*, 13, 134–140. <http://doi.org/10.1016/j.iheduc.2010.03.002>
- [3] Zanamwe, N., Rupere, T., & Kufandirimbwa, O. (2013). Use of Social Networking Technologies in Higher Education in Zimbabwe: A learners' perspective. *International Journal of Computer and Information Technology*, 2(1), 8–18.
- [4] Elkaseh, A. M., Wong, K.W., Fung. C. C., (2016) Perceived Ease of Use and Perceived Usefulness of Social Media for e-Learning in Libyan Higher Education: A Structural Equation Modeling Analysis. *International Journal of Information and Education Technology*, 6(3), 192-199. <http://www.ijiet.org/vol6/683-JR159.pdf>
- [5] Casey, G., & Evans, T. (2011). Designing for Learning: Online Social Networks as a Classroom Environment. *The International Review of Research in Open Distributed Learning*, 12(7), 1–26.

- <http://www.irrodl.org/index.php/irrodl/article/view/1011/2021>
- [6] Statistical Institute of Jamaica. (2017). Jamaican Population [Statistical]. Retrieved from http://statinja.gov.jm/Demo_SocialStats/Newpopulation.aspx
- [7] Facebook. (2016, December). Facebook Timeline. Retrieved from <http://newsroom.fb.com/company-info/>
- [8] Huang, S., & Capps, M. (2013). Impact of Online Social Network on American College Students' Reading Practices. *College Quarterly, Seneca College of Applied Arts and Technology*, 16(1). Retrieved from <http://www.collegequarterly.ca/2013-vol16-num01-winter/huang-capps.html>
- [9] Junco, R. (2015). Student class standing, Facebook use, and academic performance. *Journal of Applied Developmental Psychology*, 36, 18–29. <https://doi.org/10.1016/j.appdev.2014.11.001>
- [10] Keller, J.M. *Journal of Instructional Development* (1987)10: 2. doi:10.1007/BF02905780
- [11] Anderson, T. (2003). Getting the Mix Right Again: An Updated and Theoretical Rationale for Interaction. *The International Review Of Research In Open And Distributed Learning*, 4(2). Retrieved from <http://www.irrodl.org/index.php/irrodl/article/view/149/230>
- [12] Hicks, M., (2010). New Groups: Stay Closer to Groups of People in Your Life [Facebook]. Retrieved from https://www.facebook.com/notes/facebook/new-groups-stay-closer-to-groups-of-people-in-your-life/434700832130?_rd=p
- [13] Hagit Meishar-Tal, Gila Kurtz, & Efrat Pieterse. (2012). Facebook Groups as LMS: A Case Study. *The International Review of Research in Open Distributed Learning*, 13(4). Retrieved from <http://www.irrodl.org/index.php/irrodl/article/view/1294/2295>
- [14] Marikar, F., Alwis, K., Satharasinghe, S.N., Wickramasinghe, D.A.P., & Kariyawasam, KKGGS., (2016). MOODLE's Effectiveness in a Developing Country. *The Online Journal of Distance Education and E-Learning*, 4(3), 66–76.
- [15] Jamal, H., & Shanaah, A. (2011). *The Role of Learning Management Systems in Educational Environments: An Exploratory Case Study* (Masters in Informatics). Linnæus University, School of Computer Science, Physics and Mathematics,. Retrieved from <http://lnu.diva-portal.org/smash/get/diva2:435519/FULLTEXT01.pdf>
- [16] Darling-Hammond, L., Austin, K., Orcutt, S., & Martin, D. (2003). Learning From Others: Learning in a Social Context. In *The Learning Classroom: Theory Into Practice* (pp. 125–142). Retrieved from http://www.learner.org/courses/learningclassroom/support/07_learn_context.pdf
- [17] Joi L. Moore, Camille Dickson-Deane, & Krista Galyen. (2011). e-Learning, online learning, and distance learning environments: Are they the same? *Internet and Higher Education*, 14, 129–134. <http://doi.org/10.1016/j.iheduc.2010.10.001>
- [18] Lonn, S. D. (2009). Student Use of a Learning Management System for Group Projects: A Case Study Investigating Interaction, Collaboration, and Knowledge Construction (Doctoral). The University of Michigan, School of Education. Retrieved from http://deepblue.lib.umich.edu/bitstream/handle/2027.42/64743/slonn_1.pdf
- [19] Pilli, O. (2014). LMS Vs. SNS: Can Social Networking Sites Act as a Learning Management Systems? *American International Journal of Contemporary Research*, 4(5), 90–97.
- [20] Jamal, H., & Shanaah, A. (2011). *The Role of Learning Management Systems in Educational Environments: An Exploratory Case Study* (Masters in Informatics). Linnæus University, School of Computer Science, Physics and Mathematics,. Retrieved from <http://lnu.diva-portal.org/smash/get/diva2:435519/FULLTEXT01.pdf>
- [21] Davis, C.H.F., Deil-Amen, R., Rios-Aguilar, C., & Canche, M.S.G. (2012). Social Media in Higher Education: A literature review and research directions. University of Arizona and Claremont Graduate University. Retrieved from <http://works.bepress.com/cgi/viewcontent.cgi?article=1003&context=hfdavis>
- [22] Hunter, N. (2011, November 7). Students Who Use Facebook In Study Time Under-performing. *The Jamaica Gleaner*. Kingston, Jamaica. Retrieved from <http://jamaica-gleaner.com/gleaner/20111107/news/news6.html>
- [23] Al-Tarawneh, H. A. (2014). The Influence of Social Networks on Students' Performance, 5(3), 200–205.
- [24] Rouis, S. (2012). Impact of cognitive absorption on Facebook on students' achievement. *Cyberpsychology Behavior Social Networking*, 15(5), 296–303. <https://doi.org/10.1089/cyber.2011.0390>
- [25] Roy, S. D., & Chakraborty, S. K. (2015). Impact of Social Media / Social Networks on Education and life of Undergraduate level students of Karimganj town-A survey. *International Research Journal of Interdisciplinary & Multidisciplinary Studies*, 141–147.
- [26] Rhode, J., (2008). Interaction Equivalency in Self-Paced Online Learning Environments: An Exploration Of Learning Preferences. Capella University. Retrieved from <http://jasonrhode.com/pdfs/rhode-dissertation.pdf>
- [27] Miyazoe, T., & Anderson, T. (2010). The Interaction Equivalency Theorem. *Journal of Interactive Online Learning*, 9(2), 94–104.
- [28] Miyazoe, T., & Anderson, T. (2011). The Interaction Equivalency Theorem: Research Potential and Its Application to Teaching. 27th Annual Conference on Distance Teaching & Learning, 1–6.
- [29] Creswell, J. W. (2003). A Framework For Design. In *Research Design: Qualitative, Quantitative, and Mixed Method Approaches* (2nd ed., p. 246). University of Nebraska, Lincoln: SAGE Publications Ltd. Retrieved from http://ucalgary.ca/paed/files/paed/2003_creswell_a-framework-for-design.pdf
- [30] Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16, 297–334. Retrieved on April 23, 2017 from http://hbanaszak.mjr.uw.edu.pl/TempTxt/Cronbach_1951_Coefficient%20alpha%20and%20the%20internal%20structure%20of%20tests.pdf