Strategies for Improving E-Exam integrity

Dr. Firoz Kayum Kajrekar*[1], Dr. C. D. Sonawane[2]
*[1]Department CS & IT, SPK, Sawantwadi, Maharashtra, India
[2]Department CS & IT, YCC College, Sillod, Maharashtra, India

ABSTRACT

To improve the e-learning and test the learners online performance or credibility, some strategies are developed and put forward for the teachers. Due to lack of fair environment and authentication methods to verify the legality of the student, in the current self-learning web based or online exam system, it is difficult for staff or teachers to control credible the assessment. This study adopts a strategy for teacher and adjusted authentication process for improving higher score credibility of online exam. Survey conducted through 400 student shows that 90% students regards that online test scores are credible. According to data analysis, all p-values of questionnaires are significantly different between pre-test and post-test, but the distributions of all post-test means are not enough. After analysis of the data, 40 students were interviewed and feedback was obtained for improvements in online testing policy for future reference of teacher or faculty.

Keywords: E-Learning, Online exam, Online Test

I. INTRODUCTION

Advancement in the Information Technology and easy access to the computer hardware have encourage the use of E-learning and online testing usage. As online learning or exam in foreign language study, e-Exam tool is convenient to make a quiz for evaluating students' learning performance (Gimeno-Sanz and de Siqueira, 2012).

Beside traditional methods, new cheating techniques have been born with the increase of e-Learning or exam system (Keresztury and Cser, 2013). Some Education Researchers have discussed the enormous diversity of behaviors and types of issues that involve cheating (Koul, 2012). In an e-Learning or Exam system, many students were observed with negative behaviors such as cheating with online message exchange during their e-Learning or test. Many students believed that, it is easier to cheat in web-based versus traditional study (King et al., 2009; Keresztury and Cser, 2013). Teacher and students' credibility evaluation on e-Learning or exam is a

factor to the success of online learning or exam. Educational trust worthiness has been a continuing concern of teachers in the past year (Langa, 2013). The assessment of the current cheating on school shows that many students conduct fraud examinations on several tests (Bolin, 2004; Keresztury and Cser, 2013).

For the reliable results of test conducted with online exams, teacher are challenged with the task of creating a fairer environment. Question arising is how to find a solution to increase credibility of this e-learning or online exams conducted.

To reduce the credibility gap between the traditional exams conducted throughout the institutes and the web-based online exams, so far a face recognision and recording system has been put forward and used most widely.

After implementing face recording function, seventy four percent of the teachers and sixty nine percent of the students positively believe the online learning or

exam result (Chen et al., 2010). There are still about thirty precent of teachers concerning the score credibility. New strategies are needed to go with authentication for increasing credible assessment in an e-Learning or online exam. Therefore, this study applies authenticated system accompanying with teachers strategies to explore the credibility of current e-Learning or exam (Seidel et al., 2013). The purpose of this study includes:

- ✓ To explore teacher strategies implemented on web based learning or exam after-school e-Learning or exam and evaluate whether learner or students acknowledges the fairness of the study work or test scores
- ✓ To explore how teacher's e-Learning or exam policies influence student's authentication behaviour
- ✓ To assess whether strategies used by the teacher can enhance educator's trust on e-Learning or exam credibility
- ✓ To implement problem-solving methods in discussion with students, staffs and faculty for forming better strategies of e-Learning or e-Exam operation

II. SYSTEM DESIGN

The learning of various courses through web-based or using information technology called e learning is increasing and the learning procedure and exam score credibility has been recognized as factors to the success of e-Learning education.

In an easy cheat situation, web-based examination can only be performed as self-assessment to obtain feedback and revise mistakes because of insufficient surveillance and student identification. In contrast with traditional exam method, current studies also declared that up-to-date e-Learning or e-Exam systems are simply good using on self-assessment (Wang, 2011). Traditional and new cheating methods were considered as the huge problem, preventing examiners to believe the marks scored from e-

Learning or e-Exam (Langa, 2013; Keresztury and Cser, 2013).

Some online exam sites provide face recording function (Chen et al., 2010). In this situation, examiner still has to suffer a mental thinking, which consists of the decision that may accept some student cheating on web-based exam. Cheating actions such as replacement with exam-assistant might also happen. In this condition, the student completes the online test with negative emotion (Chen et al., 2010; Koul, 2012; Keresztury and Cser, 2013).

In order to increase the credibility of online learning or testing, this study applies teacher strategies as shown in the following figure.
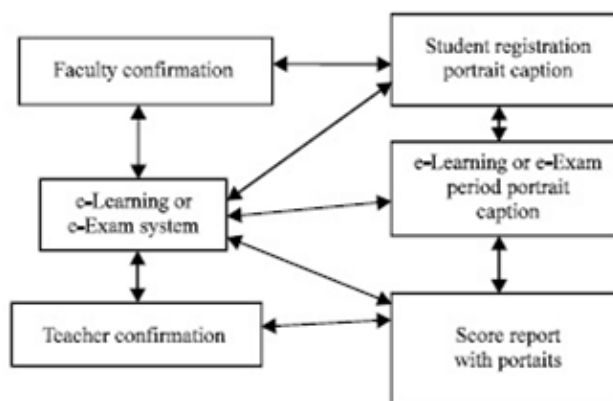

Figure 1. Teacher Policies

Figure 2. Authentication Process

The following figure also show the strategies of testing accompanied with authentication process on e-Learning or e-Exam to improve the score credibility.

The above figure applies authentication functions with e-Campus system. This e-Learning and examination system can be selected from the options by using the computer with an embedded webcam screen. It can require students to provide notebook or computer hardware MAC address registration and web links when students in off-campus study or examination at home. This feature can also record student portfolios and portrait as shown in the following figure as a process tracing of student online learning or testing.

Teacher can compare authenticated portrait with captured portraits which displaying three screen shots taken randomly throughout the online exam period.
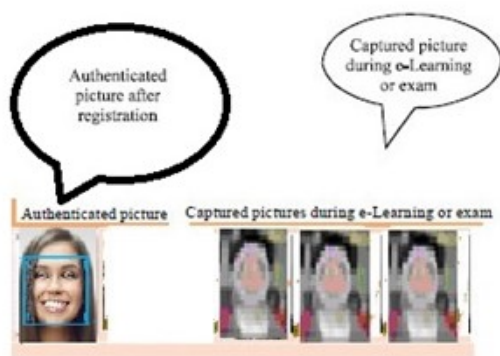

Figure 1 : Face Recognition System

III. RESEARCH MODEL

Model Development: It was discovered that teacher in earlier period of usage of web based e-Exam, would doubt the fairness of a test, and were less likely to adopt online exam for study evaluation. It may influence student credit acquirement and knowledge distribution (Chen and Liu, 2013). This study will improve the trust of the student score with authenticated process and teacher strategies. Face authenticated process as shown in above Figure-3 with portrait capture may be a suitable mechanism to prevent student substitution in e-Exam.

Web-based system captures one portrait from the webcam during online course registration and save it in the students basic record. After the registration,

student can get authentication from public authenticated schoolteacher. In a normal situation, the recorded pictures will be the same person of the original registered student. Faculty can check the student portrait which taken from the e-Learning or e-Exam (Chen et al., 2010).

The development of information technology will modify user behaviour. For example, Technology Acceptance Model, suggested by Davis (1986), primarily explores acceptance of novel information technology toward operators. Two contributing factor of perceived variables has great influences on the purpose of using new technology: Perceived usefulness and perceived ease of use. These two variables are concerned by peripheral variables as well (Davis and Venkatesh, 1996; Venkatesh and Davis, 2000). For example, e-Exam self-trust has constructive effects on perceived usefulness, indicating that higher e-Exam self-trust can make users feel that using e-exam is easy and honourable. As shown in following figure 4, the aim of this study is to know whether authenticated process, teacher
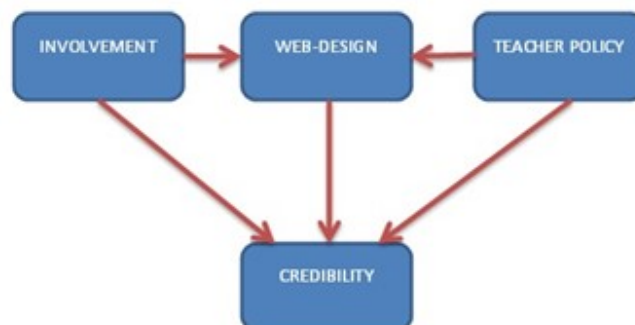

Figure 4: Research Model

strategies and student participation increase the credibility of online exam on web-based learning environment (Venkatesh and Davis, 2000; Seidel et al., 2013).

Authenticated Process: The Electronic Authentication Initiative was established in Pennsylvania in 2006 to enhance business advance. It was the first of its kind in United State of America. E-Authentication permits eligible notaries public to implement authentications electronically. In

compliance with requirements of E-Authentication, the Authenticated Public Law and the Uniform Electronic Transactions Act also amended. The Department of State has taken new steps to make e-Authentication more accessible to Pennsylvania approximately 80,000 notaries public. This study also implements e-Authentication function in research model.

Students may use some unusual policies to get better score in a web-based Exam. This problem could give rise the feelings of fault; harming their own honesty (Skagert et al., 2008). Other kinds of dishonest also happen, such as teachers performance is scored by student performance. In order to get advanced score, not only students but also more commonly teachers are involve in e-exam fraud. After the combination of authentication, the fairness of the online test may be improved (Haney and Clarke, 2007). The strategy of web design influences user trust and consequently influences online intentions (Fogg et al., 2003 Fogg et al., 2003; Chen et al., 2010).

The design of authentication of this study will be influential to build the confidence level in the student e-Learning or e-Exam. The function of the authentication is to confirm the correct identity for off-campus study students. The doubt of the online exam function forces the system designers to search a fairer solution. Face recording has been rapidly developing as one of the most significant vision performance due to its helpful applications such as individual identification (Koul, 2012; Chen et al., 2010). By adding authenticated process, a model of web-based e-Learning or exam system with credible equipment equipped with face authentication and portrait capture function can allow teacher to manage a just Test. Therefore, the credibility of the web based e-Learning or Exam is consolidation with the addition of the face authentication and portrait capture technology.

In order to test the credibility between online e-Learning or exam site credibility and authentication, the hypothesis of the relationship is listed as following:

➢H1: The e-Learning or exam site credibility is positively influenced by authenticated process

Student Motivation: Participation defines that student is motivated to use a new process. Perceived love to use has been a factor affecting information system practice and achievement. The issue of trust is in relation to student participation. Schools actively work to create practice and learning situations with the purpose of encouraging student activity and making participation possible (Thornberg and Elvstrand, 2012). Information excellence and function value are keys to the success of information system (Lin and Lu, 2000; DeLone and McLean, 1992). Motivation is a variable for measuring information system quality and examining its relationship with perceived credibility (Liuet al., 2010; Chen and Liu, 2013).

Innovated and trusted function influences user participation intention. Willing to use is the main variable in the explanation of online student achievement, as it is a critical trait in the efficiency of web-based higher education. Authenticated process is, an innovated factor may influence the purpose of participation (Castillo-Merino and Serradell-Lopez, 2014).

In order to test the relationship between online exam credibility, authentication and participation, the hypothesis of the relationships are listed as following:

➢H2: The willingness of participation positively influences the online exam credibility
➢H2-a: The willingness of participation of online exam positively influences the authentication process

Teacher Strategies: Increasing e-Exam credibility and e-Learning value is one of solution for decreasing

student knowledge divide (Chen and Liu, 2013). In a standard exam situation, class rule primarily focuses on student manners where students may not talk to help each other in exam (Langa, 2013). The standard administration level not only drives e-Learning implementation but also ensures adequate e-Exam. Teacher adoption of e-exam policies is necessary factor for successful e-learning. Students trust in teachers because of teacher respectable opinions and enlightenments and/or fair discussions and cooperative participation in decision-makings (Thornberg and Elvstrand, 2012). Teacher policies are shown to be important academic strategies, which drive e-Exam improvement. Teacher policies are also necessary for successful e-Learning management (Czerniewicz and Brown, 2009; Chen and Liu, 2013; Castillo-Merino and Serradell-Lopez, 2014).

E-Learning or e-Exam credibility is combined teacher strategies, which leads exam process normally through online exam system (Seidel et al., 2013). Teacher strategies includes offering authentication benefit for students, score acknowledgement, question skill, exam regulation, random selection of questions from a question pool, Time limitation for an Exam and examinations scheduled in the same time slot. Those have relationships with personal willingness and credibility of doing exam at web based site. Thus, the credibility of exam will be examined by the following hypotheses with the variable of teacher strategies as shown in the Figure 4 above.

In e-Learning and exam, student's attitudes toward cheating may be different between the traditional and online process depending on what students see and hear, e-Learning or exam regulation and policies adopted by the teacher and the school culture related to educational credibility (King et al., 2009; Koul, 2012). Teacher's strategies (Fig. 2) includes random selection of questions sequence from a question pool for each student, time limitation for an exam and examinations scheduled in the same time slot i.e., all students test scheduled at the beginning of 2:00 pm on the same day.

Hopefully, fairer e-Learning or e-Exam may be achieved through the development of proper Teacher's strategies. As web-based model mentioned in e-Learning system, e-Learning or e-Exam policies affect its procedure and result, with the hypothesis that the most efficient outcome will happen when information technology and exam strategies are tune fully integrated (Liu et al., 2010; Chen et al., 2010). Then, this study model adds factors of student participation, authentication and teacher police into the credibility model of e-Learning or e-Exam system:

➢ H3: Hypothesizes that e-Learning or exam credibility is positively influenced by teacher's strategies

➢ H3-a: Hypothesizes that authenticated process is positively influenced by of teacher's strategies

IV. MATERIALS AND METHODS

Teacher strategies are implemented on the process of this research (Seidel et al., 2013). At the beginning of a course, students register e-Learning system and uploads personal portrait. Students should make appointment with teacher and show up and get confirmed by faculty before the e-Learning or exam. The score report will show photo confirmation date and who confirms the photo. Before the test, all students are announced with the teacher policies of e-Learning or E-exam. When examining with the webcam-embedded screen, the system will randomly take three student portraits and record these portraits with their test report as shown in Figure 3. After the e-Learning or test, all stakeholders can look up the study process or score report (Chen et al., 2010). Then, the registered pictures will be compared with the pictures captured by e-Learning system. Then, the students are asked to fill out the research questionnaire for the credibility of score they got.

Subjects: This study implements the maximum likelihood method to estimate the model parameters for the data analysis. Subjects were enrolled in University courses and surveyed after the Web Based

Examination. The purpose of the study is to identify the student confidence level toward the web based examination. For each factor, sample factors were compared for any significant differences. It was hypothesized that significant differences in online exam credibility would exist between different factors i.e., Authentication, Participation and Teacher strategies. These dimensions were collected with questionnaire for resolving which are important factors influencing the credibility of web based examination (Westland, 2010; Otsuka et al., 2011).

Data Analysis: In order to inspect this model, the first step is to prove the construct validity that includes the confirmation of hypotheses made from this study. Factor analysis and path analysis are elementary tools used to prove the construct validation for a model. Above Table 1 shows the consequences of Exploratory Factor Analysis (EFA).

An item of score acknowledgement in the construct is deleted because it was found that it is not designed appropriately as shown in Table 1.

Table 1 : Factor Analysis				
Questionnaire	Factors			
	1	2	3	4
Easy to use Join 1		0.950		
Easy to use Join 2		0.904		
Love to use Join 3		0.926		
Authenticated Process 1	0.561			
Face Recognition 2	0.918			
Face Recognition 3	0.843			
Teacher Strategies 1				0.652
Teacher Strategies 2				0.945
Score Acknowledge				-
Credibility 1			0.905	
Credibility 2			0.975	

Initially, the questionnaire contained 11 items, but one item mentioned above is deleted during Exploratory Factor Analysis (EFA), so that the model would be more stable. Thus, the final version of the questionnaire contained 10 items. Cronbach's alpha is reliable if its value is at least 0.7. The value of Cronbach's alpha for the four constructs in this research is more than 0.8.

The average variance extracted, which is used to measure the discriminate validity of each construct, is only acceptable when it is more than 0.5 (Fornell and Larcker, 1981). The average variance extracted is generally more than 0.56. Additionally, KMO test is 0.87, which means the questionnaire was well designed. The credibility and validity of the questionnaire are both acceptable.

Statistical Analysis: All p-values of questionnaires are significantly different between pre-test and post-test, but the distributions of all post-test, means are not high enough. Then, after data analysis, we interview students and obtained some improvements of online testing strategies for future reference of schoolteacher or faculty.

SEM is a suitable research methodology to analyze the complex and multidirectional relationships between inputs and outputs in education (Castillo-Merino and Serradell-Lopez, 2014). To evaluate a model, many indices can be used to measure the appropriation of a model (Westland, 2010).

V. RESULTS

This study takes on some indices suggested by Kelloway (1998). In general, the closer observed data is to the theoretical model, the better the fit of the model and the easier it will be to satisfy the thresholds of index values. As the study of this research model as shown in Figure 5, $\chi2/df = 2.86$ (<3.0), Goodness-of-fit index (GFI) = 0.88 which is close to recommended value 0.9, Normed Fit Index (NFI) = 0.94 (>0.8), Incremental Fit Index (IFI) = 0.96 (>0.9), Root Mean Square Residual (RMR) = 0.09 (recommended value is less than 0.05) (Liu et al., 2010). Most index values comply with recommended values and estimates of regression weights are significant at p<0.001.
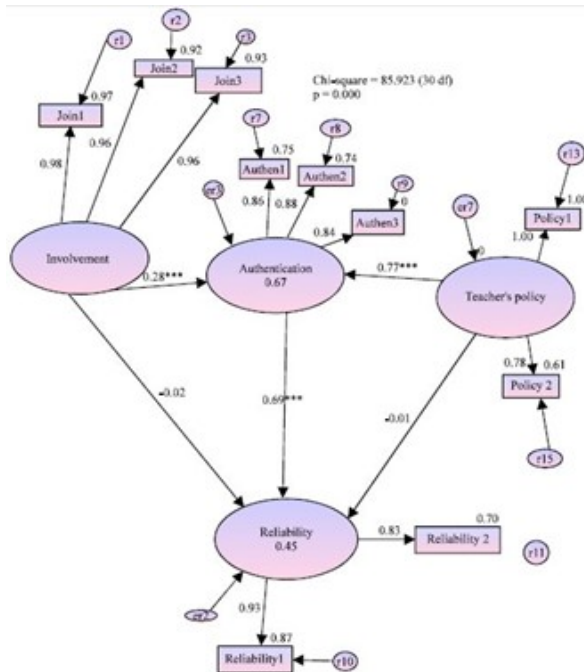
Figure 5: Structural Equation Modeling

Figure 5 shows the causal relationship between the constructs and the standardized path coefficients. H1 hypothesizes that the online exam site credibility is positively influenced by Authentication. Face Authentication and Recording technology will strengthen fairness of the online exam site. From the result of analyses, H1 is accepted because antecedent variables (Authentication) significantly ($p<0.001$) affect online exam site credibility with $R2 = 0.45$:

➢ H2: Hypothesizes that the willingness of participation is positively influences the online exam site credibility. From the result of analyses, H2 is rejected because the antecedent variable (Participation) is not significantly affecting online exam site credibility

➢ H2-a: The willingness of participation of online exam site positively influences authentication process. From the result of regression analyses, H2-a is accepted because the variables (Authentication process) is significantly ($p<0.001$) affected by willingness of participation with the $R2 = 0.28$

➢ H3: Hypothesizes that online exam site credibility is positively influenced by Teacher's strategies. From the result of regression analyses, H3 is

accepted because an antecedent variable is not significantly affecting online exam site credibility

➢ H3-a: Hypothesizes that authenticated process is positively influenced by Teacher's strategies. From the result of regression analyses, H3-a is accepted because the antecedent variable (Teacher's strategies) significantly ($p<0.001$) affects Authenticated Process with $R2 = 0.77$

Above figure 5 shows, there is strong relationship between Teacher strategies and authenticated process; the reason may be that students always accept Teacher strategies to do simple process for taking a convenient web exam when they are required. The antecedent variables (Authentication and Participation) significantly (***p) affect Online Exam Site Credibility. It means that the face authentication provide an Exam environment where substitute Exam is prohibited and identified. It also confirms that students trust the Web Exam by using the Authentication system.

VI. DISCUSSION

Good online evaluation method will guide successful web based education. This study aims to develop online testing effectiveness through the application of Teacher's strategies and authentication process. We change new factors to the model which is based on the User Acceptance Model (Davis, 1986). Online exam site with face recording has adopted in e-Learning or e-Exam model but the problem is the score credibility is not high (Chen et al., 2010). It is important to investigate student's level of credibility as regards the effectiveness e-Learning or e-exam. New strategies are applied for getting various problem-solving strategies in different problem-solving contexts (Yearworth et al., 2013). The study adds authenticated process and Teacher's strategies to an e-exam model and explore whether it strengthens the Credibility of e-Learning or e-examination. Positively, it provides some suggestions to the Teachers. According to the data analysis of hypotheses H1, H2, it implies that authenticated

process is playing important roles in constructing a reliable online testing. It can provide some suggestions to our Teachers. Figure 5 show that students accept the value of Authenticated Process. In this situation, students are also more willing to participate a authenticated process as it confirmed by H2-a and H3-a where antecedent variables (Authentication) is significantly (p) affected by willingness of student's participation and Teacher's strategies. Then, with Authenticated Process, Online Exam Site environment can attract more students to participate web Exam. From Figure 5, face authentication, participation and Teacher's strategies greatly shape how the users think toward authenticated process and credibility of online exam though the Teacher's strategies and participation factor is not directly affecting the exam credibility compared to authenticated process.

For teachers, this study also provides several recommendations as strategy to implement web based learning or examination in the following ways:

- ✓ Teacher's strategies directly affects Score Credibility and Authentication process. For example, teacher ask students to finish the testing in the same limited time period with random selected question sequence Teacher's strategies are also playing important roles in attracting student to use authenticated online testing environment. For example: Teacher's can request students to be verified of true identities at the beginning of testing registration and to be recorded at the Exam process

- ✓ Authentications significantly affects credibility of Online e-Learning or Exam. Government or Teacher should provide a authenticated public mechanism in the future. Credible system will be accepted by all stockholders and be convenient for online studying or long distance learning students

- ✓ Student's participation is playing important roles for a authenticated e-Learning or e-Exam.

Teacher should provide a series of preferential policies to attract students to follow authentication process as an encouragement or incentive. For example, in order to encourage student to finish authentication process, teacher can offer the chance of taking e-Learning or exam at home

- ✓ After data analysis, this study interviews thirty six students and get their response as " students still need to have face to face interaction with other classmates or teachers. The e-Learning and online testing may not replace all traditional styles of exam". They also suggest that online testing style can be the style of multiple choices, short-answer, single choice. Writing test is currently not sufficient enough to be scored by online testing

- ✓ Though comparing with previous 70% of credibility, 94% of the students agree that online testing scores are credible after applying Teacher's strategies and authentication. Better policies are recommended for future e-Learning or e-Exam implementation. For example, Students may take the online exam not only by editing their answers and watching video but also by speaking into the microphone to record their voice in response to a video recorded question that will trigger the students' interest and credibility (Gimeno-Sanz and de Siqueira, 2012)

- ✓ Teacher should show consistent behavior in e-Learning or e-Exam management. The different learning situation and e-Exam environment and teachers' interventions to maintain rules in each e-Exam are complicated and hard (Thornberg and Elvstrand, 2012;Langa, 2013). From the student's response of posttest interview, poor management is the number one reason for failure of credible e-Learning or e-Exam. For example, when some students couldn't take the e-Exam in regular schedule, teacher provides second chance of e-Exam for them in the same questions pool or some student exchange information with cell

phone during online test. These situations generate some unfair feeling for normal students. This is one of reasons why some teachers or students still doubt the credibility of e-Learning or exam. Teacher may apply more appropriate strategies for future e-Learning or e-Exam process to prevent students from developing negative feeling

VII. REFERENCES

[1]. Bolin, A.U., 2004. Self-control, perceived opportunity and attitudes as predictors of academic dishonesty. J. Psychol.: Interdisciplin. Applied, 138: 101-114.

[2]. Castillo-Merino, D. and E. Serradell-Lopez, 2014. An analysis of the determinants of students' performance in e-learning. Comput. Hum. Behav., 30: 476-484.

[3]. Chen, R.S. and I.F. Liu, 2013. Research on the effectiveness of information technology in reducing the rural-urban knowledge divide. Comput. Educ., 63: 437-445.

[4]. Chen, R.S., K.K. Hsieh and C.H. Tsai, 2010. The implementation of face recognition technology and its effect on e-quiz credibility. Asian J. Qual., 11: 125-136.

[5]. Czerniewicz, L. and C. Brown, 2009. A study of the relationship between institutional policy, organisational culture and e-learning use in four South African universities. Comput. Educ., 53: 121-131.

[6]. Davis, F.D. and V. Venkatesh, 1996. A critical assessment of potential measurement biases in the technology acceptance model: Three experiments. Int. J. Hum. Comput. Stud., 45: 19-45.

[7]. Davis, F.D., 1986. A technology acceptance model for empirically testing new end-user information systems: Theory and results. Ph.D. Thesis, Sloan School of Management, Massachusetts Institute of Technology, Cambridge, MA., USA.

[8]. DeLone, W.H. and E.R. McLean, 1992. Information systems success: The quest for the dependent variable. Inform. Syst. Res., 3: 60-95.

[9]. Fogg, B.J., C. Soohoo, D.R. Danielson, L. Marable, J. Stanford and E.R. Tauber, 2003. How do users evaluate the reliability of web sites? A study with over 2,500 participants. Proceedings of the Conference on Designing for User Experiences, June 5-7, 2003, New York, USA., pp: 1-15.

[10]. Fornell, C. and D.F. Larcker, 1981. Evaluating structural equation models with unobservable variables and measurement error. J. Market. Res., 18: 39-50.

[11]. Gimeno-Sanz, A. and J.M. de Siqueira, 2012. Implementing online language exams within the Spanish national university entrance examination: The PAULEX Universitas project. Procedia Social Behav. Sci., 34: 68-72.

[12]. Haney, W.M. and M.J. Clarke, 2007. Cheating on Tests: Prevalence, Detection and Implications for Online Testing. In: Psychology of Academic Cheating, Anderman, E. and T. Murdock (Eds.). Academic Press, USA., ISBN-13: 978-0-12-372541-7, pp: 255-287.

[13]. Kelloway, E.K., 1998. Using LISREL for Structural Equation Modeling: A Researcher's Guide. 1st Edn., Sage Publications, Inc., Thousand Oaks, CA., ISBN-13: 978-0761906261, Pages: 160.

[14]. Keresztury, B. and L. Cser, 2013. New cheating methods in the electronic teaching era. Procedia Social Behav. Sci., 93: 1516-1520.

[15]. King, C.G., R.W. Guyette and C. Piotrowski, 2009. Online exams and cheating: An empirical analysis of business students' views. J. Educ. Online, Vol. 6.

[16]. Koul, R., 2012. Multiple motivational goals, values and willingness to cheat. Int. J. Educ. Res., 56: 1-9.

[17]. Langa, C., 2013. Investigation of students' attitude to academic honesty-empirical study. Procedia-Social Behav. Sci., 76: 426-430.

[18]. Lin, J.C.C. and H. Lu, 2000. Towards an understanding of the behavioural intention to use a web site. Int. J. Inform. Manage., 20: 197-208.

[19]. Liu, I.F., M.C. Chen, Y.S. Sun, D. Wible and C.H. Kuo, 2010. Extending the TAM model to explore the factors that affect intention to use an online learning community. Comput. Educ., 54: 600-610.

[20]. Otsuka, T., Y. Iwao, A. Miyagishima and S. Itai, 2011. Application of principal component analysis enables to effectively find important physical variables for optimization of fluid bed granulator conditions. Int. J. Pharmaceut., 409: 81-88.

[21]. Seidel, T., G. Blomberg and A. Renkl, 2013. Instructional strategies for using video in teacher education. Teach. Teach. Educ., 34: 56-65.

[22]. Skagert, K., L. Dellve, M. Eklof, A. Pousette and G. Ahlborg Jr., 2008. Leaders' strategies for dealing with own and their subordinates' stress in public human service organisations. Applied Ergon., 39: 803-811.

[23]. Thornberg, R. and H. Elvstrand, 2012. Children's experiences of democracy, participation and trust in school. Int. J. Educ. Res., 53: 44-54.

[24]. Venkatesh, V. and F.D. Davis, 2000. A theoretical extension of the technology acceptance model: Four longitudinal field studies. Manage. Sci., 46: 186-204.

[25]. Wang, T.H., 2011. Implementation of Web-based dynamic assessment in facilitating junior high school students to learn mathematics. Comput. Educ., 56: 1062-1071.

[26]. Westland, J.C., 2010. Lower bounds on sample size in structural equation modeling. Electron. Commerce Res. Applic., 9: 476-487.

[27]. Yearworth, M., G. Edwards, J. Davis, K. Burger and A. Terry, 2013. Integrating problem solving and research methods teaching for systems practice in engineering. Procedia Comput. Sci., 16: 1072-1081.