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Determining African students' e-learning readiness to improve their e-learning experience

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ABSTRACT: E-learning connects two elements of education - learning and technology. Technology can become an enabler for learning when correctly applied. However, its success, to a degree, is dependent on the self-motivation of individuals to implement self-directed learning. One way to apply technology in higher education, and to determine if students are engaging in self-directed learning, is by implementing on-line assessments. However, the readiness of students may sometimes be ignored when planning and designing an e-learning assessment. The purpose of this article is to assess the e-learning readiness of engineering and information technology students in order to better support and improve their e-learning experience. The research followed a quantitative approach where about 50% of the students who participated agreed that they are comfortable with performing searches, downloading files and setting bookmarks (this relates to self-efficacy). For self-direction, the majority of the students were neutral when asked if they could set goals and deadlines for themselves. A recommendation is that developers could improve the required programming software platforms to suit all devices by using usability models that include ease of use and perceived usefulness. Additionally, these students need more academic support, especially with regard to developing time management and problem-solving skills.

Keywords: Self-efficacy, self-direction, on-line learning, usability models

INTRODUCTION

The traditional way of teaching has always been face-to-face in a classroom setting. Industrial revolutions have given rise to the era of technology, which has greatly influenced education, especially at university level. However, some university students are taken by the *element of surprise* after enrolling for certain courses. One of these surprises relates to the requirement of on-line learning, which is also known as e-learning. E-learning is denoted as the virtual learning environment delivered over the Internet using electronic devices, such as laptops, computers, tablets and smartphones [1]. E-learning connects two elements of education - learning and technology. Learning in the 21st Century includes digital literacy, gamification and collaborative platforms, such as learner management systems (LMS) for e-learning, and many more. The adoption of these learning methods and the e-learning readiness of students have been largely researched [2].

Technology adoption studies report on a user's behavioural intention to use a specific technology [3]. This intention to use a technology can be influenced by a student's e-learning readiness. According to Doculan, e-learning readiness can be defined as the cognitive and physical preparedness of any given institution, which could lead to the actual usage of a system, self-efficacy and self-direction [4]. E-learning readiness of students often depends on a number of factors, which include previous exposure to computers and to the Internet.

Students in developed countries are often more advantaged than students in developing countries when it comes to e-learning. A perceived gap, therefore, exists between many countries that creates an economical and technological divide, especially in education, where on-line learning is easily accessible to student masses in developed countries [5]. However, in South Africa and other developing countries, some students come from previously disadvantaged backgrounds that can affect their e-learning readiness.

A disadvantaged student may be classified as experiencing one or more of the following: being the first to go to university in the family; having insufficient preparation for university studies; numerous economic challenges; residing far from a university campus [6]. Despite the fact that the Internet is dominant and becoming increasingly adopted in many African universities, reliable Internet access still seems to be one of the biggest challenges for students in developing countries, while Internet access at school level is often also problematic [5][6]. These experiences and challenges may impact negatively on their e-learning readiness.

Some of these students may have some background of e-learning when they enter university for the first time, while for others it is a totally new environment with which they need to start grappling it in a very short time [7]. These students are usually thrown into the deep end as e-learning readiness is usually overlooked at registration. Even though the world's education system may be advancing with vast technology adoption, at different paces, there are often those who are forced to adapt or are left behind.

The purpose of this article is to assess the e-learning readiness of engineering and information technology (IT) students in order to better support and improve their e-learning experience. The article is structured as follows: appropriate literature covering previous student e-learning readiness studies and their results is outlined first. The article then reports on the context and methodology. A qualitative study follows to present the results and discussion thereof. Lastly, the study sums up with a conclusion and recommendations.

STUDENT E-LEARNING READINESS STUDIES

According to literature, e-learning refers to a learning structure that can be achieved via the Internet by means of a technology device and its purpose is to provide an ubiquitous interactive learning environment [8]. According to Smuts et al, learning using technology requires *…a clear marriage of the technological managerial and pedagogical domain* [9]. This signifies that technology must be aligned with good teaching and learning practices. These teaching and learning practices include e-learning readiness, which is denoted as a user's ability to use e-learning systems and its technological tools [10]. E-learning readiness is a multifaceted construct that assesses self-efficacy, self-direction, interaction, attitude and self-motivation [11].

In this article, only self-efficacy and self-direction will be reported on as they are the key constructs in ensuring that students become advocates of their own study needs. These two constructs relate to the belief that students have to complete a study and the corresponding action that they take in that regard. Self-efficacy is a belief that students have the potential to learn and grasp coursework up to an adequate level [12].

Self-direction is often referred to as self-directed learning, which is action based. It is the procedure in which a student takes the initiative without assistance from anyone, to articulate learning goals, identifying learning resources and evaluating their learning outcomes independently [13]. Self-efficacy and self-direction are constructs of e-learning readiness, which was brought about by the need to evaluate the social, technological and organisational preparedness of users [14]. The readiness of users for e-learning has been evaluated in various environments.

As companies are increasingly turning to e-learning for training and development, the United States conducted a study to determine if their management employees were ready for on-line learning. This study took the form of a survey, and the participants were employed full-time and older than 18 years of age. The results revealed that age had a significant relationship to e-learning readiness, where mature individuals seemed to demonstrate more e-learning readiness [15]. This was in line with another study in which it was discovered that age and prior internet exposure are significant variables for e-learning readiness [16].

In Taiwan, a study was conducted to explore the e-learning readiness of public librarians. This study applied the e-learning readiness constructs, which address self-direction and e-learning attitudes. The results indicated that perceptions of public librarians regarding self-direction learning readiness and e-learning attitudes were positive. The results also indicated that the respondents who had previous training in e-learning performed better than those who had not [8]. These results are in concurrence with the study by Doculan, which indicated that in order to enjoy the benefits of e-learning, an organisation needs to be prepared or trained effectively [4].

According to a study conducted in Kenya, technological readiness is the most important factor in determining e-learning readiness [17]. The purpose of that study was to determine e-learning readiness at public secondary schools. The results indicated that the technological readiness of teachers and learners was very low as most of them lacked computer devices, never accessed the Internet and they had no access to on-line libraries [17]. This suggests that many of these learners have been disadvantaged, as they have not enjoyed the opportunities that students in developed countries may have had when it comes to Internet access.

At the Durban University of Technology in South Africa, the Department of Nursing conducted a study to determine the e-learning readiness of their first-year students in order to adapt to the newer teaching methods (e-learning). It was found that the students were psychologically ready for e-learning. However, they were lacking the technological readiness and devices for e-learning [18]. According to Freeze et al, users are often unaware of e-learning requirements, which include network and Internet access [19]. It is, therefore, important to ensure that users are trained and prepared for e-learning in order to ensure its effectiveness.

STUDY CONTEXT

This study focused on first-year students registered for a National Diploma in IT (NDip IT) that was implemented in 2018. This diploma has 390 credits associated with it and requires three years of study to get the qualification.

After completion of this diploma, learners will graduate with system analysis, database development and management, project management and programming skills. It is, therefore, a requirement that these learners are e-learning ready as the module materials, assignments, assignment submissions and some tests are on-line.

These modules are offered over a 14-week period, where students engage with two practical classes and two theory classes per week. Each class is scheduled for one hour and 25 minutes. The modules have three tests, of which two are practical tests and one is a written test. Students are primarily evaluated on their skills of programming on Visual C# and problem solving. In the practical class, the students apply what they have learned in the theory classroom in the form of short exercises and tutorials. The key sections in the syllabus include demonstration of an understanding of C# applications, problem solving, understanding of arithmetic operators, understanding of decision statements and methods.

METHODOLOGY

In this study, a quantitative approach was followed in which an on-line questionnaire was distributed to 134 participants from two programming modules and 84 participants responded (63% response rate). A qualitative approach is an enquiry that allows researchers to develop a deeper understanding of a topic [20]. First-year engineering and IT students registered for two different programming modules - Software Applications 1 and IT Essentials 1. All students were invited to complete the questionnaire, so no sampling technique was required. The questionnaire was completed on an on-line survey platform called Question Pro.

Participants accessed the questionnaire via a link provided on their e-Thuto platform. The questions were derived from previous on-line readiness questionnaires, which addressed self-efficacy and self-direction [20][21]. The questionnaire is, therefore valid, and the results would be reliable, as the questions have been used in previous research relating to this topic. The questionnaire applied a 5-point Likert scale with 20 close-ended questions. These close-ended questions consisted of five questions, which addressed self-efficacy and five addressed self-direction. The rest of the questions addresses some of the e-learning readiness constructs. In this questionnaire, participants had to choose their agreement or disagreement to statements, where 1 means strongly disagree; 2 - disagree; 3 - neutral; 4 - agree; and 5 - strongly agree.

The data was analysed in Question Pro using descriptive statistical analysis, which focused on central tendency (mean) and dispersion (standard deviation and variance). Descriptive statistics are measures used to summarise datasets in order to reveal certain characteristics about the data [21]. Ethical clearance was approved at the Faculty Research and Innovation Committee of Central University of Technology (CUT), Bloemfontein, Free Sate, South Africa.

RESULTS AND DISCUSSIONS

The results of this study include Figure 1 (age), Figure 2 (computer device) and Table 1 (results relating to the two constructs). According to Figure 1, the majority of participants were between 18 and 24 years of age, which is the same as the average age of first-year students enrolling at university in South Africa [18].

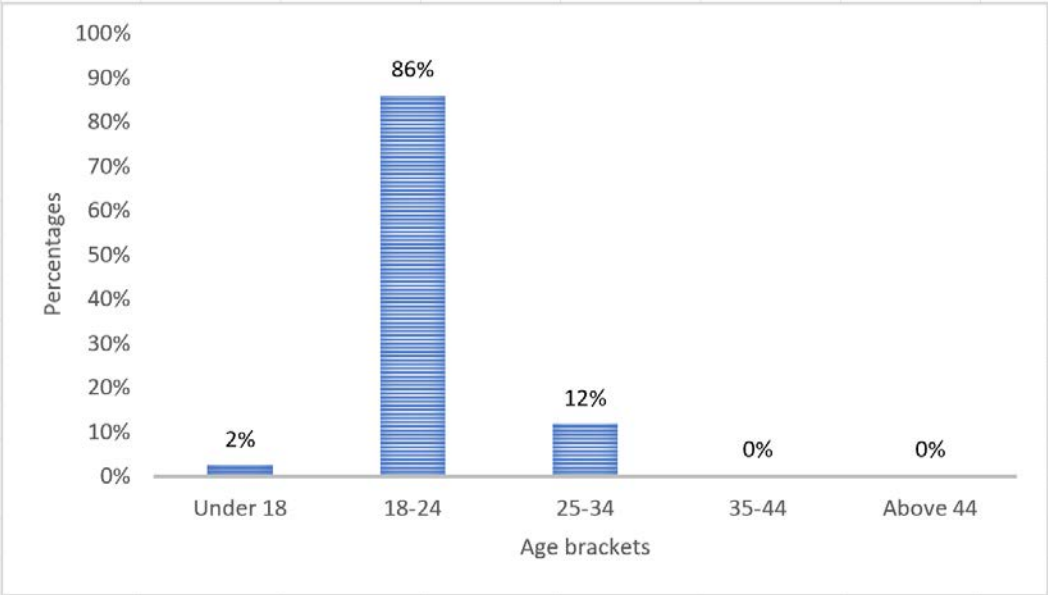

Figure 1: Age brackets of the respondents.

A mobile device or a computer device is a requirement for e-learning. The participants had to indicate they agreement or disagreement to a statement in this regard. According to Figure 2, about 53% of the participants agreed that they owned such a device. This could be because for IT students, a computer device is a requirement [11].

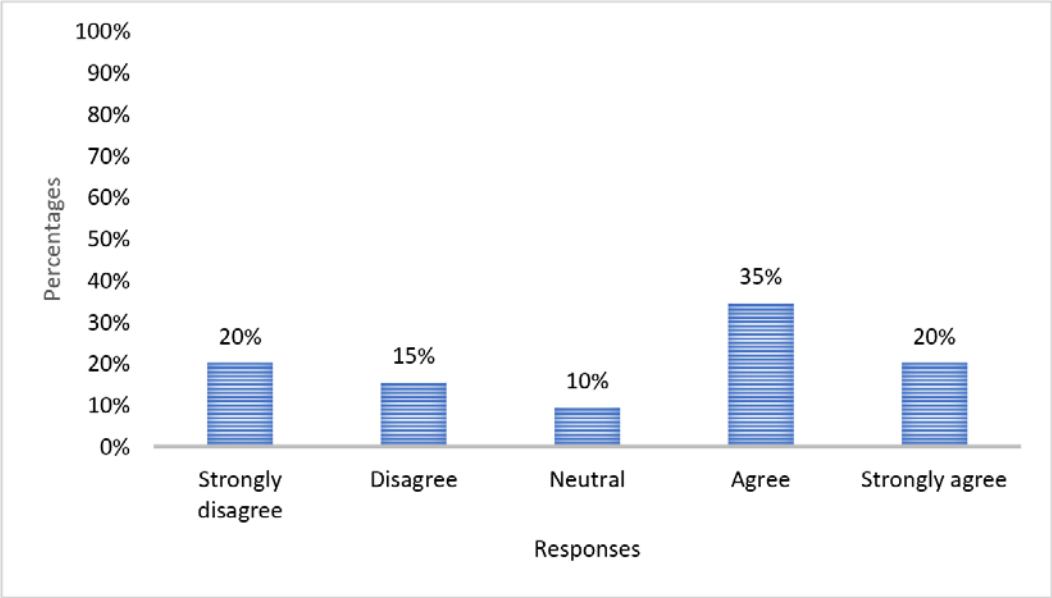

Figure 2: Students' responses to whether they own an electronic device.

Table 1 consists of the mean, standard deviation (SD) and the variance of the main constructs regarding self-direction and self-efficacy. For self-direction, the highest mean is 3.95 with a SD of 0.89. Possible reasons for this could be that downloading, setting bookmarks and conducting research are the most standard functionalities that students might be familiar with through social networking. According to Habibi et al, taking advantage of social media functionalities in teaching and learning enhances self-direction [22]. The lowest mean for self-direction is 3.39 with the highest SD of 0.92. This indicates that students need more academic support in terms of providing motivation, which has been noted in other research [23]. The SD of 0.92 indicates that the data is dispersed over a wide range of values around the mean, indicating that students provided a range of answers to this question. Some of these students would, thus, need more academic support than others, depending on their given answers.

Table 1: Mean, standard deviation and variance of self-direction and self-efficacy constructs.

Close-ended questions	Mean	SD	Variance
Self-direction			
I am good at setting goals and deadlines for myself	3.45	0.84	0.71
I finish the projects I start	3.93	0.72	0.52
I have developed good ways to solve problems I come across	3.65	0.70	0.49
I am comfortable conducting searches, setting bookmarks and downloading files	3.95	0.89	0.79
I learn fairly easily and I do not need to be pushed	3.39	0.92	0.84
Self-efficacy			
I do not quit just because things get difficult	3.75	0.97	0.94
I can keep myself on track and on time	3.35	0.78	0.61
I must read my coursework and learn it best on my own	3.80	0.82	0.67
I learn best when I figure things out for myself	3.25	1.04	1.08
I learn equally well in a group and on my own	3.76	0.87	0.76

For self-efficacy, the highest mean is 3.80 with a SD of 0.82. These results are for the statement, which determined whether or not the participants could read and learn their coursework on their own. The mean result may indicate that the participants are capable of self-directed learning, as noted in other work [13]. The SD result indicates that the data is dispersed around the mean, therefore, the participants' responses did not widely differ. The lowest mean for self-efficacy is 3.25 with a SD of 1.04. The participants had to indicate whether they learn best when they figure things out for themselves. The mean reveals that these participants struggle to figure out things on their own, therefore, they need more academic support from lecturers to enhance their problem-solving skills. The highest SD also occurs for this statement, being 1.04. This result means that the data is dispersed over a wide range of values, which indicates that some students need more academic support than other students do.

CONCLUSIONS AND RECOMMENDATIONS

The purpose of this article was to assess the e-learning readiness of engineering and IT students in order to better support and improve their e-learning experience. A quantitative approach was followed in which an on-line questionnaire was distributed to 134 participants from two programming modules and 84 participants responded. The results included age and

ownership of an electronic device, as well as responses to questions relating to self-direction and self-efficacy, as they are key constructs towards determining e-learning readiness.

According to Figure 1, the majority of participants were between 18 and 24 years of age. Reasons for this majority could be that the average age of first-year students enrolling at South African universities is between 18 and 24 years of age.

According to Figure 2, about 53% of the participants agreed that they owned an electronic device. This could be because for IT students, a computer device is a requirement. Additionally, this also indicates that 47% of students need more access to on-campus computers to do their coursework. The results in Table 1 include the mean and SD of self-direction and self-efficacy constructs.

According to Table 1, for self-direction, the highest mean was 3.95 with a SD of 0.89. Possible reasons for this could be that downloading, setting bookmarks and conducting research are the most standard functionalities that students might be familiar with through social networking. For self-efficacy, the highest mean was 3.80 with a SD of 0.82. These results are for the statement, which determined whether the participants could read and learn their study material on their own. The mean result may indicate that the participants were capable of self-directed learning. The SD result (0.82) indicates that the data was dispersed around the mean, therefore, the participants' responses did not widely differ. These two positive results suggest that many of the participants are e-learning ready to a certain degree. However, there were some low means scores in the dataset.

The lowest mean for self-direction was 3.39 with the highest SD of 0.92, where students had to indicate if they learn fairly easy without being pushed. The mean indicates that students need more academic support in terms of providing motivation. The SD of 0.92 indicated that students provided a range of answers to this question. Some of these students would, thus, need more academic support than others, depending on their given answers. The lowest mean for self-efficacy is 3.25 with a SD of 1.04.

The participants had to indicate whether they learn best when they figure things out for themselves. The mean reveals that many of these participants struggle to figure out things on their own, therefore, they need more academic support from lecturers to enhance their problem-solving skills. The highest SD also occurred for this statement, being 1.04. This result means that the data was dispersed over a wide range of values, which indicates that some students need more academic support than others. Altogether, they need more motivation, better access to on-campus computer laboratories and further assistance in developing their problem-solving skills. This is essential in order to enable them to take learning initiatives, to articulate learning goals, to identify learning resources and to evaluate their learning outcomes independently.

The limitations of this study are that the data was only collected from two first-year engineering and IT modules. For future work, the data could be collected for the whole faculty in order to gain more insight and establish other means of academic support. Learning in the age of technology may seem easier. However, some students may not find this easy, and would require more academic support to become e-learning ready. This can then enable them to progress in their learning, so that they may achieve their educational goals.

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