

# USING SELF-PACED ONLINE TUTORIALS TO BRIDGE THE DIGITAL DIVIDE AMONG FIRST-YEAR STUDENTS

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**ABSTRACT** – This paper responds to the research question whether self-paced, online tutorials are a viable methodology to address the computer-skills development need of first-time entry students at a Faculty of education at a higher education institution in South Africa. A substantial number of teacher-education students who enter the Faculty of Education at an urban university in Johannesburg, South Africa, do so with limited or no computer skills or experience. Baseline data collected over a period of five years show that as much as 43% of students who enter the teacher- education programme, have never used a desktop computer before. Although most of these students are proficient in the use of mobile applications, they are not necessarily digitally literate. Mobile devices such as tablet computers and smartphones have limited capacity for creating and editing digital documents, spreadsheets and presentations, as teachers would typically require. Further, 'The Framework for Teacher Education' of 2011 (revised 2015) requires that student teachers should be “competent in using ICTs”. The teacher education programme of the Faculty of Education does not make provision for teaching basic computer skills. The resource-intensiveness of computer skills training precluded face-to-face teaching. Subsequently, the Computer Skills Development Programme (CSDP) was developed as an online, self-paced learning programme. Interactive, open-source tutorials were used, covering computer basics, the internet, word processing, spreadsheets and presentation tools. The tutorials were delivered using the institutional LMS, Blackboard. Online quizzes, using objective-type items were used to assess knowledge and skills. Students could attempt quizzes as many times as needed to pass. Strategies that were used to ensure the fidelity of student attempts at the quizzes were uniquely generated quizzes from a pool of questions, test items were randomised when delivered, and response options were randomised. A strict and challenging time limit prevented students from looking up answers. Test items were delivered one at a time.

In 2016, 412 students completed the programme. Students were requested to complete a survey about their learning in the programme at five intervals. The response rate average for the five surveys was 29%. The Cronbach alpha measure for reliability yielded a range of values between 0.781 and 0.824 for each survey. An analysis of the histograms for each survey showed that data were normally distributed. Results across the five surveys were consistent, and it was decided to use the fifth, and final survey responses for analysis.

The results of the analysis show that students reported that the programme improved their computer skills; that online tutorials are appropriate for learning computer skills; that the quizzes accurately measured their skills; and that the award of “Badges” played a significant role in their motivation to learn in the programme.

The research results show that online tutorials may indeed be a viable option to address the challenge of the digital divide, and further that objective online assessment is a feasible strategy to assess computer skills.

**Keywords:** Online Education; Online Computer Competency Tutorials; Student Motivation; Digital Badges

## 1. INTRODUCTION

It is no longer a debate whether Teacher Education Institutions (TEIs) should train teacher education students to integrate Information and Communication Technologies (ICTs). Firstly, the rapid pace by which ICTs have permeated all of society, means that school-leavers should exit high school with well-established digital skills if they were to succeed in the workplace. There is a widely-held belief that ICT

skills and knowledge are key determinants of prosperity in countries, and especially so in the developing world. Secondly, the proliferation of eLearning at Higher-Education Institutions means that students who enter these institutions without digital skills will be at a distinct disadvantage. Finally, the benefits of ICTs for teaching and learning have been widely established, but the successful use thereof is dependent on skilled teachers who know how to integrate ICTs appropriately into their teaching and learning practices. Central to the successful use of ICTs in schools stands a well-qualified, digitally skilled teacher.

Therefore, the aim of the research that is reported on in this paper is to respond to the research question whether self-paced, online tutorials are a viable methodology to address the computer-skills development need of first-time entry students at a Faculty of education at a higher education institution in South Africa.

In this paper, I first contextualise the use of ICTs in teacher training within the South African context. Then, the concept of Digital Badges in education is described. This section is followed by a description of the Computer Skills Development Programme that is the focus of this paper.

## **2. ICTs AND TEACHER TRAINING**

Although the ubiquitous use of ICTs for teaching and learning in schools in South Africa is in its infancy, there is a groundswell of digital integration for teaching and learning across South African schools. Consequently, several public and private companies and non-governmental organisations have put projects in place for the professional development of teachers. Examples of these projects are the *Microsoft Partners in Learning*, *Intel Teach to the Future*, *Telkom Connected Schools*, *Vodacom Digital Classroom* and the *SchoolNet Commonwealth of Learning Certificate for Teacher ICT Integration* projects (SchoolNet, 2017).

This research however is concerned with the initial teacher education endeavour. According to the national policy, *The Framework for Teacher Education* of 2011 (revised 2015), computer competency is considered as fundamental learning, and the policy dictates that student teachers should be “competent in using ICTs” and that they should be able to integrate ICTs in teaching and learning (Department of Higher Education and Training, 2015). The onus is therefore on TEIs to ensure this.

However, a substantial number of teacher-education students who enter the Faculty of Education at an urban university in Johannesburg, South Africa, do so with limited or no computer skills or experience. Baseline data collected over a period of five years show that as much as 43% of students who enter the teacher-education programme, have never used a desktop computer before. Although most of these students are proficient in the use of mobile applications, they are not necessarily digitally literate. Mobile devices such as tablet computers and smartphones have limited capacity for creating and editing digital documents, spreadsheets and presentations, as would typically be required of teachers.

The theoretical frame for this research is drawn from work about the benefits of ICTs in the teaching and learning endeavour, and the value of obtaining basic computer literacy skills. It further draws on work about the use of digital badges in education as an important factor in motivating student learning.

According to Wild and Oliver (1995), for students to benefit most from ICTs, they “need to have some knowledge of the machine, possess experience and skill in the use of various applications such as word processors and databases” (p.1090). The notion that basic knowledge and skills of ICTs are a

prerequisite for integration, is supported by the UNESCO ICT Competency Framework. This framework identifies *Technology Literacy* as the first stage of a teacher’s development. Within this stage, broad knowledge of ICTs (Basic Tools) is identified as one of six “aspects” of each stage (UNESCO, 2011). Trucano (2005), in an *infoDev* publication, identifies the lack of teacher’s confidence in their own ICT skills as an impediment to ICT integration. A further scan of the literature yielded sufficient evidence that there is a set of basic or essential ICT skills that all teachers should have to ensure successful ICT integration. The most common skills that are recommended by a variety of authors and organisations are: web searching, word processing, connecting and collaborating with social media, using mobile devices, knowledge of computer interfaces, presentation tools, and spreadsheets (see Thompson, 2014; NCTL, 2015 and eDTech, 2015).

### 3. DIGITAL BADGES IN EDUCATION

Lately, digital badges are increasingly being considered as an alternative method to indicate student performance. Digital badges are visual representations of student performance in the form of digital images that contain meta data that spell out the performance which is represented by the badge. These images can be displayed or embedded on websites. Finkelstein, Knight, and Manning (2013) state that digital badges capture and communicate the knowledge and skills that an individual can demonstrate at different levels of performance or engagement.

According to Gibson, Ostaszewski and Flintoff (2015), badges are an element of gamification, and are used to motivate students (also see Abramovich, Schunn and Higashi, 2013). Nisperuza (2014), Finkelstein, Knight, and Manning (2013) list the following advantages of using badges as an alternative form of recognising student performance:

- Increased student motivation, time on task, engagement and retention,
- Visible and clear individual learning paths,
- Enhanced learning competitiveness,
- Reward for additional effort, and
- Increased and open visibility of performance.

Badges can typically be issued using a number of platforms, for example *Credly* ([www.credly.com](http://www.credly.com)), *Open Badges* (<https://openbadges.org/>) and *Mozilla Backpack* (<https://support.mozilla.org/en-US/kb/what-is-a-mozilla-backpack>).

### 4. THE COMPUTER SKILLS DEVELOPMENT PROGRAMME

Considering the clear lack of basic computer skills that a large portion of teacher education students have upon entry at the TEI, and the view that basic computer skills are a prerequisite to successful ICT integration in teaching and learning, and the imperative that the *Framework for Teacher Education of 2011* (revised 2015) sets to graduate ICT competent teachers, a Computer Skills Development Programme (CSDP) was developed as an online, self-paced learning programme. Due to constraints in resources, it was not deemed feasible to offer such a programme in a face-to-face mode. Therefore, a programme was devised using interactive, open-source tutorials from the *GCFLearnfree.org* website. The topics covered are displayed in Table 1.

**Table 1: Topics and sub-topics in the CSDP**

Broad topic	Specific Topics
Computer Basics	Computer hardware, mouse skills, keyboard skills
Using a computer	Operating system interfaces, file management, computer maintenance, basic troubleshooting
Going online	Browsers, search skills, email, internet safety
Word processing	Text editing, layout, inserting images and objects, proofing, review, tables, heading and page numbering.
Spreadsheets	Using spreadsheets, data types, sorting, basic functions and formulas, charts
Presentation tools	Designing slides, transitions and animations, presentation skills

The tutorials were delivered using the institutional LMS, Blackboard. Online tests followed each tutorial, using objective-type items which assessed knowledge and skills. In total, seven tests were developed (two tests had to be completed for Word Processing and Spreadsheets). Students could attempt the tests as many times as necessary in order to pass the tests. A number of strategies were used to preserve the fidelity of each test that was attempted by a student. For example, each test was uniquely generated from a pool of questions, test items were randomised for delivery, and response options were also randomised. A strict and challenging time limit for each test prevented students from keeping a test open and looking for answers to the question items, as the test would auto-submit when the time expired. To further curb cheating, test items were delivered one at a time on the screen, and students could not move forward or backwards in a test.

It was acknowledged that several students may already possess some or all the skills that were developed by the programme, or even may even have extra-curricular qualifications in end-user type programmes. These students, and students who had the school subject Computer Applications Technology (CAT) at school, were exempted from the programme.

It was a concern that students would not take the programme seriously if their participation and performance were not monitored. Three strategies were used to heighten engagement in the programme: Firstly, weekly announcements were made in which students were encouraged to participate, and an overview of progress was given. Secondly, the *Retention Centre* functionality of Blackboard was used to send out alerts to students who either were not participating and performing well enough in the tests according to set criteria, or to students whose participation and performance were 20% below that of their peers. However, the most successful strategy that ensured student participation proved to be the use of digital badges.

In the Computer Skills Development Programme (CSDP), badges were enabled by using the *Achievements* functionality of Blackboard. Three kinds of badges were devised: Firstly, *participation* badges were issued when a student used the *Review* function in Blackboard to indicate that they have reviewed a tutorial, or when they completed a survey. A special participation badge was also issued to students who reviewed all five the tutorials. Secondly, *performance* badges were issued. For example, if a student attained a pass mark (70%), a “pass badge” would be issued. However, to improve student motivation and increase learning effort, badges were created for several levels of performance, for example “Super Exclusive Club” badges for achieving 100% for a test. Finally, *completion* badges (in the form of a printable certificate) were issued when students passed all tests with 70% or more. Table 2 shows some of the badges that were used:

Table 2: Selected badges used in the Computer Skills Development Programme

 <p><b>Reviewed Learning Unit 1</b> Milestone Reviewed the contents of Learning Unit 1</p>	 <p><b>Achieved 70% for LU 1 Test</b> Milestone Achieved outcomes for LU 1: 70% achieved for Test 1</p>
 <p><b>Completed Second Month Survey</b> Milestone You completed the second month survey</p>	 <p><b>Digitally Literate (Cum Laude)</b> 🏆 Course Completion You have achieved an average of at least 80% for <b>each</b> of the tests</p>
 <p><b>Mad Skills!</b> Milestone Mad Skills! 90% average for all tests!</p>	 <p><b>The super-exclusive 100% Club: LU 1</b> Custom There are only a few of us that can attain this badge!</p>

## 5. METHOD

Data were collected using a short, 13-item questionnaire that evaluated student experience of the CSDP. The entire cohort of students were sampled. At five intervals during the year, students were requested to complete the questionnaire, which required Likert-type response options ranging from ‘Very Strongly

Disagree' to "Very Strongly Agree', using the Blackboard *Survey* tool. In addition, system data were drawn from the Blackboard Grade Centre to determine student effort and performance. A total of 412 students completed the programme successfully. Initially, Blackboard report the completion rate for the surveys to range between 132 (32%) for the first questionnaire and 125 (30.3%) for the final questionnaire. On closer inspection, seven of the survey attempts that were recorded, contained no responses. I suspect that these empty attempts were made to register an attempt at the test in order to get a badge, and perhaps also the 100% participation badge. In this paper, I will report the final survey data, and specifically two constructs were identified for analysis:

'Perceived efficacy of the programme (3 items)', and 'influence of badges in the programme' (3 items).

IBM SPSS (v24) were used to compute the descriptive statistical data. The Cronbach alpha measure was used to compute the reliability of the instrument and returned a value of 0.78. The Cronbach alpha for 'perceived efficacy of the programme', and 'influence of badges in the programme', were isolated for reliability analysis, and yielded values of 0.73 and 0.83 respectively. These values are considered to be good. Histograms were generated for each of the items, and the data were normally distributed.

All ethical procedures for research, as prescribed by the Faculty Ethics committee were adhered to.

## 6. RESULTS

Table 3 contains the descriptive data generated by student responses to the six items that were isolated for analysis:

**Table 3: Descriptive statistics**

Item	Valid N	Mean	Median	Mode	SD
The programme improved my computer skills	113	4.57	5	4	1.12
Online tutorials are appropriate for teaching ICT skills to me	111	4.48	4	4	1.06
The tests measure my computer skill appropriately	115	4.60	4	4	.981
The badges motivated me to learn	113	4.67	4	4	1.12
I will redo a test in order to get a better badge	110	4.42	4	4	1.16
Knowledge of the badges of other students have motivates me	111	4.58	4	4	1.24

An analysis of the data presented in Table 3 shows that the majority of the responses in each of the measures of central tendency are aligned to the 'Agree' response option. The relatively small SD show that most of the students responded using closely-related response options.

A binomial grouping of responses into two categorical responses, 'disagree' and 'agree' is more illuminating. When this analysis is performed, it becomes clear that the vast majority of students agree that online programme served its purpose, and that they are motivated to learn due to the use of badges. Table 4 begins to illustrate this point:

**Table 4: Frequency table for responses**

Item	VSD	SDA	D	A	SA	VSA
The programme improved my computer skills	4.4	1.8	2.7	41.6	23	26.5
Online tutorials are appropriate for teaching ICT skills to	1.8	0.9	9.0	45.9	20.7	21.6
The tests measure my computer skill appropriately	0.9	1.7	4.3	43.5	28.7	20.9
The badges motivated me to learn	2.7	0.9	4.4	39.8	23	29.2
I will redo a test in order to get a better badge	2.7	1.8	11.8	39.1	23.6	20.9
Knowledge of the badges other students have motivates	2.7	2.7	10.8	30.6	24.3	28.8

The frequency of the response options were divided into two categories (disagree and agree), and were then summed per category to determine the proportion of responses as a percentage. When this data is presented graphically (see Figure 1), it becomes abundantly clear by which margins

students responded positively to the programme. In the case of all the items, students overwhelmingly selected either agree, strongly agree, or very strongly agree as response option.

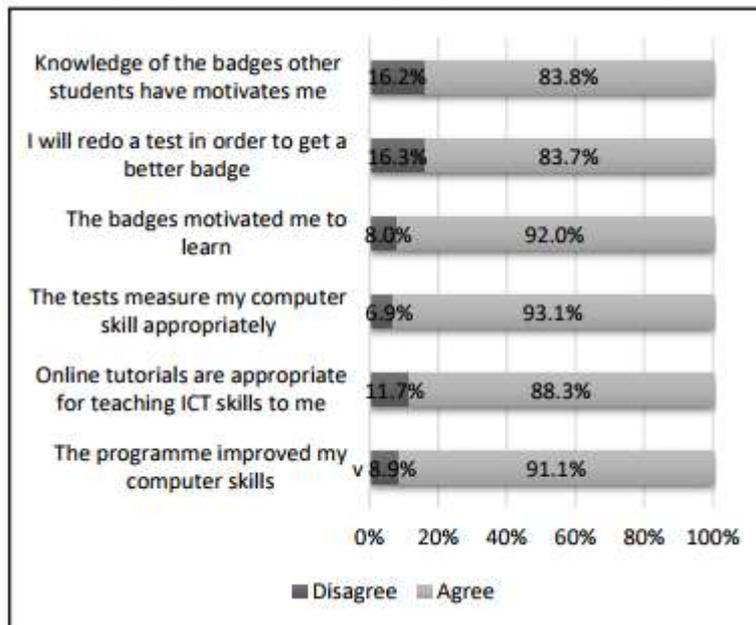


Figure 1: Responses categorised as either agree or disagree

## 6. CONCLUSION

This research project showed that teacher education students are overwhelmingly supportive of the use of online, self-paced tutorials for acquiring ICT competencies, and that they believe that such competencies can be assessed by means of online tests. The research further showed that digital badges can play a major role in student motivation. The research is an initial attempt at exploring the efficacy of online tutorials and the affordances that badges bring to student motivation. In future research, the theoretically founded affordances that badges bring to student motivation needs to be used as a platform of larger-scale research project. Such a project could be conceived as a design experiment, and more rigorous research instruments should be developed.

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