Blended Supervision for Thesis Projects in Higher Education: A Case Study

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Abstract: The thesis component of a degree program is vital since the quality of it contributes to the quality of the whole degree. Maintaining the quality of the degree programs and handling the constantly increasing numbers of students entering higher education simultaneously is a challenge for many higher educational institutions. This paper presents a study of how ICT can be used to improve the quality and effectiveness of the thesis projects at Bachelors and Masters Levels. Further, how the blended model of supervision supports solving the issues of managing supervisor time efficiently and providing a quality guidance for thesis students are also explored. Supervisors’ perceptions of the ICT enabled thesis process are captured via interviews. Statistics about the completed theses and the user log data of the ICT system are triangulated to complement supervisor perceptions. Results revealed that the supervisors take advantage of the functions in the system to support improving the quality and the quantity of the theses, and the blended supervision model adapted in the thesis process support the supervisors to have a better collaboration with the students.

Keywords: Thesis, higher education, blended supervision, quality improvement

1. Introduction

In higher education, completing a thesis project is compulsory or preferred by any degree program, since it reflects analytical skills, decision making, organizing and delivery of innovative content. However, for many students, the path to success of thesis work is quite a lonely and tiresome task. Irrespective of whether on campus or distance, thesis work is a very much isolated and individual activity compared to the other courses in the degree program (Aghaee, 2015). Many students never complete their thesis works. From those who complete, only a few students manage to finish within the stipulated period and achieve a thesis of good quality. By 2008, the problem of low quality of the completed Bachelor’s and Master’s theses and the number of thesis attrition (dropout) was identified as a major problem at the largest department of computer and systems sciences in the Nordic countries (Allen, et al., 2008). It has been shown in many studies including (Allen, et al., 2008; McGaha & Fitzpatrick, 2005; Nicpon, et al., 2006) that the inability to complete a thesis mainly contributes to increasing dropout rates in many degree programs. On the other hand, failures in the thesis process may not solely depend on the student’s inability to perform the tasks in the thesis process. Physical limitations to exchange ideas with supervisors and peers; lack of continuity of assessment of the quality of work; missing important information about the thesis project and the process; lack of chances for comparison of performance with peers due to isolation; lack of infrastructure or academic support from the institutional perspective, and so on may also be contributing to hinder the success (Aghaee, 2015; McGaha & Fitzpatrick, 2005; Nicpon, et al., 2006).

How to maximize the throughput of the theses in universities has been a topic of investigation for many years, as performance rate of thesis projects is important in maintaining the reputation of the academic institution. The quality and completion rate of the theses at universities can be increased by improving the quality of the thesis process, increasing supervision hours, increase of group projects, changing evaluation procedures, student counselling, including courses for how to conduct research work into curriculum, meta supervision, engaging the students in the ongoing and practical projects, encouraging close ties with the industry so that the students get the motivation to complete and continue working in the same industry, and so on (Karunarathne, et al., 2017). Among the other factors, interaction plays a major role according to (Aghaee, 2015). There can typically be three types of interaction, student – content, student-student, and student – supervisor (Goodyear & Ellis, 2008). Student – supervisor interaction is the central among other interactions, as supervisors agreement is a major factor for the success of the thesis (Soares da Costa, 2016). However, the student – supervisor interaction is individualistic and driven by the preferences and specific styles of supervision (Hansen & Hansson, 2016). Literature provide categorizations of supervision styles based on their nature of supervision. E.g. Dysthe (2002) identifies three types of supervisors. Supervising as a teacher, where the student follows the supervisors’ instructions during the study, resembles the conventional form of teaching. A friendly atmosphere with more distributed responsibility is created in the partnership model. The
third model Dysthe (2002) brings in is the model of apprenticeship, where the student is in a partnership that is influenced by the authority of the supervisor. Seven different types of supervisors are listed in (Soares da Costa, 2016), namely, the know-it-well, absent, the perfectionist, very hands-on, the pessimist, the friend, and the coach. The differences of the supervision models are based on how the supervisor instructs the students, how do they deal with the guidance to writing, resource discovery, and sharing, frequency and forms of supervisor meetings, etc, (Karunaratne, et al., 2017). Accordingly, supervision styles in general are influenced by the individual preferences of the supervisors when deciding on when to meet, how often, and where and how to communicate (face-to-face, forum, voice conferences, etc.). Some supervisors prefer ad hoc meetings, that is, scheduling a meeting when students have problems or when they request for a meeting. Other supervisors prefer regular and pre-planned face-to-face meetings individually and/or in a seminar form with fellow students. Some supervisors rely solely on distance technology in supervision due to many reasons including demographic distance. However, many of the related studies have pointed out the relation between the flows of supervision and student drop out from thesis projects (Dysthe, et al., 2006; de Kleijn, et al., 2012).

Automated systems that support student and course management have been in use in education for many years. The efficiency and effectiveness of these systems, especially when scaling up of the programs to meet the increasing demand for education, are shown in many related studies. For example, the IT-system for thesis support, SciPro (Supporting the Scientific Process) (Hansson, et al., 2009) manage hundreds of students on average per academic semester, where about two thirds of them are at the Bachelor’s level (mainly Swedish students) and the rest are at the Master’s level (mainly international students). They interact with approximately fifty supervisors who also present themselves, their research topics and preferred mode of supervising in the system. The system provides support for matching between students and supervisors, accessing supervisor/student information, querying from thesis and supervisor support facilities, referring and sharing learning content such as video films and other related materials, booking seminars, use of the peer and supervisor discussion forums, managing the milestones in the thesis process, etc. (Karunaratne, et al., 2017). The support provided by such an ICT system could complement the thesis supervision process in such a way that the supervisor need not necessarily be available for many parts of the thesis process, yet the student receive all the support needed to fulfill his or her tasks.

This study investigates how does the blending of ICT complement thesis process. Therefore it explores the effect of the IT support system in reducing the issues in thesis supervision and retention of dropout students. The Department of Computer and Systems Sciences (DSV), Stockholm University and the thesis support system SciPro is taken as the case to investigate. Thereby an effort is taken to demonstrate a case of blended supervision and how it bridges the gap of the student supervisor communication problems.

The rest of the paper is organized as follows. The next section focuses on the domain in focus and the use of blended supervision at DSV. Section three describes the methods we adopt to investigate how blended supervision affects the quality and the number of theses produced at the department, followed by the results and the discussions and finally, conclusions drawn from this investigation and possible further works.

2. Background and the domain in focus

At the Department of Computer and Systems Sciences (DSV), students at Bachelors level take a thesis worth of 15 credits during the final term of the third year of the program. Masters level thesis work carry 30 credit points. As stated above, in 2008, a large-scale evaluation about education conducted at the department suggested improving the quality and the number of thesis projects at the department. An ICT support system has been introduced in the department to support the thesis process with the aim of addressing the following issues:

- Students struggle in finding a supervisor, resulting in delays in starting the thesis project
- Supervisors spend most of their supervision time for management of the thesis leaving very fewer opportunities for students to get feedback and coaching in the actual research work
- Quality control of the thesis is difficult due to the complexity of collaboration with the supervisor, reviewer, peers, thesis opponents, as well as active participants in the final seminar.
- Communication with the supervisors is difficult since planning supervisor meetings require contacting them personally to agree on supervision times. Students may need to knock the door to see the availability of the supervisor or communicate many times via emails, etc.
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- Supervision process is not transparent, therefore, if there is any issue related to supervision, the student become isolated, and get lost in the process
- Planning the final defense is difficult as it involves many parts, such as reserving the time of the participants and reserving a venue, submitting the thesis and controlling for plagiarism, managing the opponent and active participants, etc.
- Difficulty in tracking the resources used or discussed during the thesis period, and, managing and providing feedback for the thesis draft at different levels.
- Finding relevant information for thesis work, including general and specific literature, thesis templates, and other required resources
- Supervision and management of students taking thesis in distance programmes

2.1 Thesis process at the Department of Computer and Systems Sciences (DSV)

The thesis process at DSV is structured as illustrated in Figure 1 below.

Figure 1: Thesis process at DSV (Source: https://thesisinfo.dsv.su.se/thesis-process)

The complete thesis process at DSV consists of five phases, 1) preparation, 2) research question and method, 3) results and discussion, 4) final seminar and 5) thesis examination. What functions the students and supervisors perform during each phase is listed in Table 1.

<table>
<thead>
<tr>
<th>Phase</th>
<th>Student</th>
<th>Supervisor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiation</td>
<td>Students fulfill prerequisites for writing the thesis</td>
<td>Supervisors are allocated a quota of students for the term</td>
</tr>
</tbody>
</table>
| Phase 1 | • Find a thesis topic (idea) or choose from available ideas from supervisors  
• Hold the first meeting with the supervisor to agree upon/ refine the topic and plan the research  
• Create/modify a project proposal | • Submit ideas at least to fulfill the allocated quota, or pick an idea from students  
• First meeting with the student to plan the research  
• Feedback/ approve the project proposal (can be iterative) |
| Phase 2 | • Create the research questions and methods  
• Improve the thesis draft based on feedback from the supervisor  
• In the case of supervisor/reviewer reject the draft of the thesis, upgrade it until it's approved  
• Make the thesis draft available for other peers to review  
• Review two other student theses at the same level | • Advice and re-evaluate research question and methods (this can be iterative)  
• Approve the draft of the thesis and send to a reviewer (another professor at DSV) (this can be iterative until the reviewer approves the draft) |
| Phase 3 | • Conduct the empirical study/ experiment/data collection  
• Complete thesis draft, get supervisors’ approval and make it available for 2nd peer review  
• Review two other thesis drafts | • Advice and guide student/ provide feedback |
| Phase 4 | • Finalize the thesis draft  
• Submit the thesis in the platform once the supervisor finalizes the final seminar arrangement  
• Be an opponent for another final seminar and actively participate in two other final seminars (register in the platform) | • book a date and room for a final seminar  
• assign the numbers of active participants to the final seminar  
• Plagiarism control of the submitted thesis  
• Host the final seminar |
| Phase 5 | • Upgrade the thesis draft based on the feedback received in the final seminar  
• Submit the final draft | • Evaluate the final draft and grade the thesis  
• Check if all the peer reviews and oppositions are completed  
• Coordinate with the panel of examiners for finalizing the grade  
• Report the grade obtained and achieve the thesis |
The thesis process at DSV is complex and requires extensive collaboration among not only the student and the supervisor, but also the co-supervisors if any, the reviewers, and the examination board as well as fellow students who participate in peer reviews. The thesis support system SciPro takes care of many of the activities in the thesis process as discussed in (Karunaratne, et al., 2017; Larsson & Hansson, 2013; Larsson & Hansson, 2011). The main information and communication channels of the thesis process is presented in Figure 2.

![Image of information and communication channels in the thesis process](image)

**Figure 2:** information and communication channels in the thesis process (ref: Karunaratne, et al., 2017)

In a thesis project, students interact with content (thesis draft), with peers and with supervisors. At each of these interactions there exist questions to answer. Table 2 gives a summary of those interactions.

**Table 2:** Interactions in thesis process (ref: (Karunaratne, et al., 2017))

<table>
<thead>
<tr>
<th>Entity</th>
<th>Interaction</th>
</tr>
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</table>
| Self-assessment | Checklists:  
First meeting: 9 questions  
Project plan: 11 questions  
Rough draft: 9 questions  
Result and discussion: 11 questions  
A complete thesis version 1: 22 questions  
A complete thesis, revised: 22 questions  
Grading criteria: 18 aspects |
| Peer review online (peer review 1 and 2) | Project plan: 11 questions  
Rough draft: 9 questions  
Result and discussion: 11 questions |
| Peer review in final seminar (Opponent 1) | Written opposition report aligned with the grading criteria (18 aspects)  
Oral presentation and discussion |
| Peer review in final seminar (Opponent 2) | Written opposition report aligned with the grading criteria (18 aspects)  
Oral presentation and discussion |
| Peer review seminar: Active participants | 5-15 oral questions |
| Reviewer | Rough draft approval: 6 aspects |
| Reviewer | Final seminar manuscript approval: 18 aspects |
| Reviewer | Grading: 18 aspects |
| Supervisor | Oral and written feedback throughout the whole process, including validation, summaries and comments of feedback listed above: individual supervision, seminars, and online forums. Estimated feedback aligned with grading criteria: 18 aspects x 6 times |
| Supervisor | Grading: 18 aspects |
| Examiner | Grading and reporting: 18 aspects |
| Total | 316 interactions |
2.2 Blended approach for thesis supervision

Blended learning is ubiquitous in education, especially with the rapid evolution of ICTs in education. As a result, tools and technologies that can be used to blend traditional classroom teaching and learning processes have been emerging in recent years (Garrison & Kanuka, 2004). However, the blended form of thesis supervision has gained comparatively less attraction. Some examples of blended supervision can be found in the field of medical and health sciences, specifically in laboratory experiments, practicing medical surgeries, simulations of the body, visualizing natural phenomena and so on (Ingham & Fry, 2016). Blended forms of supervision by a group of supervisors, with the focus of the effect of integrating the expertise of supervisors of different areas of strengths together by efficient collaboration using ICT tools, is discussed in (Donnelly & Fitzmaurice, 2013).

ICT can be supportive for blended supervision such that important information, guidelines, and related resources could be structured into the thesis support system to allow students access without the guidance of the supervisor. Such a facility saves a lot of the supervisor’s time of repeating the same information to all the students s/he supervises (Hansen & Hansson, 2016). The ability to organize virtual meetings cuts down traveling times for physical meetings, and allows having the meetings at flexible times. The space for synchronized and asynchronized communication via an online forum reduces communication gaps (Aghaee, et al., 2013). Table 3 shows which supervision tasks can be offered using ICT.

Table 3: The blended model of supervision

<table>
<thead>
<tr>
<th>Supervisors tasks</th>
<th>Mode and method of performing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supervisors are allocated a quota of students for the term</td>
<td>Information is present in SciPro.</td>
</tr>
<tr>
<td>Submit ideas at least to fulfill the allocated quota, or pick an idea from students</td>
<td>Upload to the idea/s section of the SciPro system. Check available ideas</td>
</tr>
<tr>
<td>Filling the quota of students by selecting student ideas or student pick from the entered ideas by the supervisor</td>
<td>The system automatically matches the idea once selected and create a thesis project in SciPro.</td>
</tr>
<tr>
<td>Arrange first meeting with the students matched</td>
<td>Booking the meeting is done via SciPro.</td>
</tr>
<tr>
<td>Research plan is created together with the student</td>
<td>Create in SciPro.</td>
</tr>
<tr>
<td>Advice on the research topic /provide feedback</td>
<td>Face to face or online meeting. Summary of the discussion and resources exchanged can be archived in SciPro.</td>
</tr>
<tr>
<td>Approve the project proposal</td>
<td>Via SciPro.</td>
</tr>
<tr>
<td>Advice and re-evaluate research question and methods</td>
<td>Literature is in Thesis info pages in SciPro</td>
</tr>
<tr>
<td>Send the first draft to a reviewer (another professor at the department)</td>
<td>Via SciPro (Interaction with reviewer)</td>
</tr>
<tr>
<td>Reviewer communication with supervisor for clarifications etc. if needed</td>
<td>Via SciPro (Interaction with reviewer)</td>
</tr>
<tr>
<td>Advice and guide student/ provide feedback during the empirical study/experiments</td>
<td>Face to face and/or via SciPro</td>
</tr>
<tr>
<td>Approving the final draft</td>
<td>Via SciPro</td>
</tr>
<tr>
<td>Check requirement for final thesis, i.e., if all the peer reviews are completed</td>
<td>Information are already in SciPro after the task is fulfilled</td>
</tr>
<tr>
<td>Book the final seminar</td>
<td>Via SciPro</td>
</tr>
<tr>
<td>Plagiarism control for the submitted thesis</td>
<td>Automatically done in SciPro</td>
</tr>
<tr>
<td>Host the final seminar</td>
<td>Face to face or online</td>
</tr>
<tr>
<td>Grade the thesis</td>
<td>Grading criteria is in SciPro; supervisor fills in the relevant parts of it. The final grade is automatically calculated</td>
</tr>
<tr>
<td>Coordinate with the panel of examiners for finalizing the grade</td>
<td>Communication via SciPro</td>
</tr>
<tr>
<td>Report the grade obtained and achieve the thesis</td>
<td>Grade is automatically sent to the student management system from SciPro</td>
</tr>
</tbody>
</table>

It is pointed out that the new and developed criteria for improving the quality of the thesis process at DSV would be nearly impossible to perform without increasing the supervision hours accordingly unless ICT support is present (Aghaee, et al., 2013).
3. Data and methods

As stated above, this study investigates the effect of the ICT support system used at the Department of Computer and Systems Sciences and thereby try to answer the questions of 1). What problems in the thesis process have been solved by blending of ICT in thesis process 2). How the SciPro system does supports blended supervision and 3). How has the quantity and quality of the theses improved over the years at DSV. The strategy followed in the study include both explorative (qualitative) and quantitative approaches.

3.1 Data and data collection methods

Qualitative data: The data collection strategy chosen in this study is the survey methodology. Interviews are conducted to investigate the issues related to the thesis process at the department, To study the blended supervision process, and how ICT smooths out the supervision process, four supervisors are selected randomly, and their perceptions were captured via deep interviews. The interview also aimed at understanding the challenges the department faced in offering the thesis projects at Masters and Bachelors levels before the SciPro system is implemented. Interview questions were related to 1) the supervisor’s experience and practices before the reforms to the thesis process. 2) challenges of supervision, and, 3) the experience and practices after the reforms and ICT is introduced.

Quantitative data: Data accumulated in the SciPro system is the quantitative data used in the study. The “completed thesis” dataset consists of the information about completed theses at DSV since 2008. There are 2609 entries in the dataset which each instance correspond to information of a student who completed theses during seven years from 2008. Altogether there are six attributes, namely, Thesis ID, Student Name, Supervisor Name, Thesis topic, Date completed, and Grade obtained. Thesis ID is of type numeric, and date completed has the data type Date. The rest of the attributes are of type string. The user logs dataset consists of a set of user click logs of the system in the period from 2013 January to 2015 May. This log data is pre-processed into attribute-value form with 21 attributes of the functions listed in Table 3. The data set consists of 43500 entries.

3.2 Data analysis methods and tools

Both qualitative and quantitative data analysis methods are used. A triangulation approach (Bogdan & Biklen, 2006) is followed where the interview data are triangulated with the quantitative data. Maxqda (MAXQDA, 1989-2016) is used for transcribing and analyzing the interviews. The visualizations and summarisations of the quantitative data are carried out using R (R Core Team, 2014).

4. Results and discussion

This section presents the results of the empirical study

4.1 What problems in thesis process has solved by blending of ICT in thesis process.

Starting the thesis: Results from the transcribed interview data revealed that the main bottleneck in the thesis projects at DSV in the pre- SciPro era was regarding the matching of student thesis topics with suitable supervisors. The coordinator of the thesis projects explains

“I had to knock the doors to request if the supervisors are willing to take those (students) who are struggling to find a supervisor.”

“Some supervisors tend to quickly pick the good students (who were performing better in the courses). I (myself) had to supervise more than ten students with lower grade point averages (per term).”

“There was no systematic allocation of students for supervisors.”

“The matching of students to supervisors happened throughout the year, making it very difficult to provide orientation facilities for students starting thesis work.”

“It is natural that some students waste weeks of their study time trying to find a supervisor.”

SciPro matching of supervisors to students is autonomous, and the log data of SciPro shows that the matching has been done well ahead of the official start of the thesis process. This allows students to utilize a complete 20 or 10 weeks to engage in conducting their study. Figure 3 is a plot of the number of days between the
actual start of the thesis and the student finds a supervisor during the period of January 2013 to February 2015.

Figure 3: number of days from finding a supervisor to the official start of thesis project

Figure 3 shows that most of the thesis projects at DSV nowadays start on time, and by the time of start all the students have supervisors for their thesis projects. The dots of the scatter plot in Figure 3 around January corresponds to the date of start of both Bachelors and Masters Theses. Bachelors thesis of 15 credit points starts in April and October as well.

Supervision time and communication with the student: According to the outcome of the interviews, communication between the supervisor and student was problematic without the support from the ICT system.

“Complaints from students about communication issues with the supervisors were not surprising”

“Coordinator receives many emails per day about not knowing the deadlines, and various other missing information”

“I had to repeat the same information to many students, and still there could be a chance that I missed one student”

“I and many of my colleagues find it difficult to manage with student communication especially when I am traveling abroad for longer periods. It is not surprising if I miss student’s emails in my over flowing mailbox”

“The threads of the communications I had with my students is not easy to trace, so sometimes I am not sure what we agreed previously”

SciPro focuses mainly on clear communication and providing structured information. SciPro thesis information pages include all the required information in a structured way so that any student can find them very easily (Aghaee, et al., 2013). The interviews justified this fact as follows:

“I am no more worried about students miss information. Instructions are provided to students in the beginning”

“In the back seat of a bus in rural Africa with my roaming broadband I could provide feedback to my students”
“In a day during the period of reporting the grades myself and many other supervisors were in a presentation and at the same times SciPro is opened in our laptops”

SciPro functions that allow collaboration among the students and supervisors include Forum, which is the messaging service of SciPro and the Files, which is the file archive in SciPro. These facilities have become popular with the time as can be seen by the log data analysis results in Figure 4. Figure 4 (top) shows the frequency of using the Forum function each day of the year. High frequency of usage corresponds to the active period of the thesis. Similar pattern exists in the usage pattern of uploading files (bottom figure) as well. The usage also increases each year.

![Figure 4: Usage of Forum and Files function](image)

**Communication among the student, supervisor, and reviewer:** Communication among the stakeholders in the thesis project had many gaps, due to delays in responses, but communication via SciPro is transparent which motivates supervisors and reviewers to respond timely. For example

> “Whenever the student or the reviewer (supervisor) perform an activity I receive a notification, which I can respond even without login into SciPro. The discussion is saved in Forum so the thread of communication is visible”;

> “I make sure myself to respond quickly since the delay is visible otherwise”

The role of a reviewer is introduced to the thesis process from the year 2014 onwards. The functions of communication with the reviewer have been evolved during the time as well according to Figure 5. These to functions are used only two times per thesis. So one may not expect high frequencies here compared to that of Figure 4.

![Figure 5: Communication with the reviewer](image)

**4.2 How does the SciPro system support blended supervision**

As illustrated in Table 3 many supervision activities are completely delegated to SciPro system. Some other activities, such as managing student queries, etc. has become efficient. The interviews justified how it becomes easy and efficient for the supervisors. E.g., Supervisors state:
“I do not need to check many places for information. All my projects can be checked from one place, it saves lots of my time”

“If I am not sure what to do next (in the thesis process) I can go to SciPro and check it”

“I think it is the volume of information that I can handle in SciPro very efficiently”

“The checklists in SciPro tells the students what they are supposed to do. So I save half of my time”

“Students are much more prepared now than before even in the first meeting”

“Selection of students are based on ideas, not any other preferences, so both student and supervisor have a topic that they like to work with”

“I can easily fill in my quota of students with the ideas I like or I posted in SciPro idea bank”

“Organisation of final seminar is the most efficient”

“The planning features in SciPro is great and saves a lot of my time”

“Automated grading criteria saves time as well as I don’t miss any point of the 18 parts of it in grading. It also allow easily compare my grading with the reviewer and examiner panel’s”

“System is in the cloud, so I can supervise and manage students from anywhere in the world”

Supervisor perceptions justify the success of the blended supervision model adapted in the SciPro system. Further, the quantitative data shows that the number of available supervisors has not been increased in the department proportionately to the number of students enrolled in (and completing) the thesis at the department. Figure 6 shows the number of supervisors involved each year and the number of students completed the thesis project during 2008-2014.

Figure 6: Number of supervisors and number of completed thesis at the department during 2008-2014

Thesis completion at the department was increased from 59 to 557 during a seven years’ period as shown in Figure 6. However, the rate of increase of the number of supervisors are less than that of students, i.e., from 20 to 112, which has resulted in an average of twice as many students are supervised now by supervisors at the department compared to 2008. This increase in the throughput was in parallel with improving the quality of the thesis. This justifies that the blended supervision model allow supervisors handle more students than before.
4.3 How did the quantity and quality of the theses improved over the years at DSV?

Figure 6 above showed the increase of the numbers of completed theses from 2008, but how has the quality changed over time? A thesis at Bachelors or Masters Level receives a grade in A-E scale. There is no fail in the thesis, which means if the thesis is not up to the standard of a pass (Grade E) then the thesis is not completed. In Figure 7 completed theses are categorised into three groups (excellent, good and fair) and shows the number of excellent (A, B) grades, good (C) and fair (D, E) grades obtained by the completed thesis during 2008-2014. The improvement of the number of excellent grades and the respective drop of the number of fair grades justifies the quality improvement of the thesis process. With the moderate increase of the good grades, it can be assumed that some of the theses that could end up fair grades were able to raise for good grades and good to the excellent.

![Figure 7: Number of Excellent, good, and fair theses at DSV during 2008-2014](image)

5. Summary and Discussion

The results of this study showed the impact of using an ICT system during the whole thesis process with respect to the supervisor perspective. It showed the improvement of information accessibility, communication and collaboration. Hence, the activities that impact most in the supervisors’ point of view are summarised as follows.

Thesis Administration:

- Matching with suitable supervisors and students
- Allocating peers and reviewers
- Allocating venue and composition for final seminar/public defense of thesis
- Controlling the thesis for plagiarism
- Administrating the grading and reporting

Thesis Supervision:

- Scheduling/conducting meetings and activities
- Delivery/exchange of relevant information
- Punctuality in providing feedback and other necessary information
- Transparency in communication

Collaboration:

- Self-assessment of student’s work
- Peer interaction
- Reviewer interaction
- Transparency in interaction
Further, the blended supervision model presented in Table 3 is shown to be effective, since it has enabled the department to implement the improved thesis process, which contributed to enhancing the quality of the theses produced at the department. Neither were additional hours required to be allocated to supervisors, nor was the number of supervisors increased to facilitate the increasing numbers of students. Therefore, both the quality and the quantity of theses at DSV has been improved by the support of the ICT system and blended supervision model.

6. Concluding remarks

To support a comprehensive thesis process aiming to solve the issues related to Masters and Bachelors theses, the Department of Computer and Systems Sciences introduced a blended form of supervision. How the use of ICT helped in improving the quality and quantity of the theses at the department and how the blended supervision model facilitated are investigated in this study. The supervisor’s perceptions of blended supervision practiced in the department were captured via interviews. The descriptive data about the completed theses and the log data of the SciPro thesis support system are used to complement supervisors’ perceptions. The results showed that the use of ICT system has enabled an efficient and effective thesis process. The blended model of supervision helped supervisors for enhanced collaboration and efficient management of the thesis project, resulting in an improvement in the thesis quality and quantity over the time. This study, however, did not cover if there are any differences in the perceptions or the use of the ICT support system, concerning different supervisor types. Such a study would be a future extension of this work. Furthermore, use of ICTs creates an internal digital divide among the users, which has not been investigated here and left for further studies.

References


Effect of a Metacognitive Scaffolding on Information Web Search

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Abstract: The objective of the research was to determine the effect that a metacognitive scaffolding for Web information searches exercises on the development of school students, through a general chemistry course in a blended learning modality. One hundred and four students from a school of the city of Bogotá D.C.-Colombia participated in the study. The research followed a quasi-experimental design with a pretest and posttest. Three tenth-grade groups, previously established, worked with a b-learning environment with three versions: the first group worked with a fixed scaffolding, the second with an optional scaffolding, and the third group interacted with a b-learning environment without any type of scaffolding whatsoever. The Metacognitive Awareness Inventory (MAI) test was used to measure metacognitive abilities before and after data treatment. To analyze the data, a Multivariate Analysis of Covariance (MANCOVA) was conducted, which showed that the fixed scaffolding favors the development of metacognitive abilities, especially those related to procedural knowledge, planning, organization, monitoring, and evaluation. This tool, possibly based on the analysis and reflection of their own performance in task development, allowed students to consolidate structured strategies in Web information searches. In contrast, the use of the optional scaffolding did not exhibit the expected results since it was not used by a high percentage of students. These findings, among others, are discussed in the study.

Keywords: Scaffolding, information search, metacognitive ability, b-learning environment, secondary education.

1. Introduction

It is evident that the use of the Internet is becoming increasingly frequent in school environments due to the availability, diversity, and accessibility of information that is found in this communication medium (Marhan, Saucan, Popa and Danciu, 2012; Saito and Miwa, 2007; Spink, Park and Koshman, 2006). In spite of the generalized use of the Internet in the completion of learning tasks, the quality of the assignments submitted by students is not as expected; consequently, the learning outcome derived from this process is not the one desired by teachers (Arango, Bringué and Sádala, 2010; Chli and Wilde, 2006; Li and Lim, 2008; M. Zhang and Quintana, 2012).

This issue could indicate that students neither perform effective information web searches, nor do they engage in a reflection process about their own knowledge construction based on the searches conducted through this medium (Sun, Ye, and Hsieh, 2014). Regarding this question, some authors assert there are three possible causes why students do not perform effective information Web searches: one refers to the poor efforts made to read and understand the results of their searches, limiting themselves to only copying and pasting the information found (Li and Lim, 2008; Wallace, Kuperman and Krajcik, 2000).

A second reason relates to how easily students become disoriented on the Web due to the large quantity of information available therein (Dias, Gomes and Correia, 1999) and, finally, one related to lacking the skills to monitor, evaluate, and regulate online information search (Quintana, Zhang and Krajcik, 2005; M. Zhang and Quintana, 2012; W. Zhang, Hsu, Wang and Ho, 2015).

In view of this problem, the community of information technologies applied to education proposes, designs, and validates scaffoldings aimed at favoring subjects’ performance when autonomously engaging in learning tasks in Web environments and, thus, facilitate the acquisition of information search skills, improve learning processes, and propose strategies for the development of metacognitive abilities, among others (Molenaar, Van-Boxtel and Sleegers, 2010; Quintana et al., 2005; Valencia-Vallejo, López-Vargas and Sanabria-Rodríguez, 2018; Zhang and Quintana, 2012; Zohar and Barzilai, 2013).

In this field of work, different researchers have designed and implemented, in computational scenarios, fixed and optional scaffoldings to support students in task development. Fixed scaffoldings permanently support the

student through a series of pop-up messages, which are oriented toward guiding and focusing task development. The messages are always shown intentionally so that in this way, the student always takes them into account during the progress of the learning activity (Kim and Hannafin, 2011). To this extent, when the support is constant or fixed, the development of different students’ cognitive abilities is positively affected (Chang, Sung and Chen, 2002; Lee and Songer, 2004; Greene and Azevedo, 2009; Wang and Lin, 2007; Wecker, Kollar, Fischer and Prechtl’s, 2010).

On the other hand, optional scaffoldings are available in the computational scenario as a “help tool”. The novice is informed about said tools and he decides when to use it (Lakkala, Muukkonen and Hakkarainen, 2005). In that regard, Cagiltay (2006) proposes it be the student who decides whether to use or not to use the scaffolding in task development, obeying their individual differences and learning needs. In accordance to the foregoing, it is evident that not all students require the same type and intensity of the support through the scaffolding. In addition, it is feasible that these aids fade over time as the student acquires the skills and abilities developed with these pedagogic and/or didactic tools.

From this discussion, it is possible to identify a contradiction between the benefits that may result from the use of fixed or optional scaffoldings, when students individually learn in computer-based learning environments. For this reason, it is necessary to conduct other studies aimed at understanding and explaining what is the most effective manner of supporting students when interacting with this type of scenarios (Chang, Sung and Chen, 2002; Lakkala et al., 2005). Taking into account this issue, the following research question is posited:

What is the effect generated by a b-learning environment that contains within its structure a fixed scaffolding or, an optional scaffolding, and another, without any type of scaffolding whatsoever, on the development of cognitive abilities in high school students when they perform Web information searches?

The foregoing research questions posits as the hypothesis of interest in the present study, if the use of a metacognitive scaffolding of an optional type for a Web information search, available in a b-learning environment, significantly favors the development of metacognitive abilities in comparison to those students that use a fixed scaffolding in the same b-learning environment.

2. Literature Review

2.1 Metacognition in Learning

Flavell (1979) coined the term of metacognition and defines it as the knowledge that a person has about his or her own cognitive processes and the control they can exercise on these. It refers to the ability that individuals have to manage and regulate their own learning processes. Research findings in the educational context systematically show that individuals that deploy metacognitive abilities have high probabilities of reaching the learning goals and improving their academic performance, in comparison to those that exhibit a deficit in this type of abilities (Hacker, Dunlosky, and Graesser, 2009). Similarly, findings indicate that metacognition is a strong predictor of novices’ academic performance (Bromme, Pieschl and Stahl, 2010; Desoete, Roeyers and De Clercq, 2003; Hacker et al., 2009; Thiede, Anderson and Therriault, 2003).

In general, a novice that possesses metacognitive abilities in their own learning process may be defined as a student that is able to formulate concrete learning goals for themselves, plan activities to reach them, systematically monitor their performance during the execution of said activities, continuously self-evaluate themselves according to the set goals, make the necessary adjustments as a function of the goal, and finally, assess the result of their learning (Pintrich, 2004; Zimmerman, 1986).

2.2 Metacognitive Scaffoldings

The concept of scaffolding was defined based on the Zone of Proximal Development (ZPD) posited by Vygotsky, in his sociocultural theory of learning and it refers to the assistance an adult can provide a child with the purpose of fulfilling the latter’s learning objectives (Tuckman, 2007; Wood, Bruner and Ross, 1976; Wu and Pedersen, 2011). A scaffolding is a type of aid that is provided to the student to successfully develop a learning task (Wood et al., 1976). Metacognitive scaffoldings favor planning, monitoring, self-evaluation, and control of cognitive processes, in a conscientious manner, during the development of learning tasks in computational
environments (Kim and Hannafin, 2011; López-Vargas, Ibáñez-Ibáñez and Racines-Prada, 2017; Zhang and Quintana, 2012).

In that regard, Quintana et al. (2005) and Molenaar et al. (2010) state that metacognitive scaffoldings are characterized by managing and regulating cognitive processes. This type of scaffoldings helps the student: (1) plan what they want to learn; in other words, it proposes defining learning goals and planning the necessary activities to achieve them, (2) execute and monitor the progress in the proposed goals and activities, and (3) evaluate the results obtained with the purpose of reviewing the planning and adjusting the strategies to achieve the learning goals. This process lets the student gain knowledge on their way of learning and, in this sense, it allows them to make decisions on choosing the most effective and efficient strategies to achieve the desired learning, among others (Azevedo, 2005; Hederich-Martinez, López-Vargas and Camargo-Uribe, 2016; Molenaar et. al., 2010; Quintana et al., 2005).

Among metacognitive scaffoldings, those of a fixed-type are proposed, which offer the student permanent support during task development. This scaffolding is intentional and evident within the computer-based learning environment. It is displayed in the form of pop-up windows directed toward guiding task development and is characterized by always being present in the computational environment, independent of students’ learning characteristics and needs (Kim and Hannafin, 2011).

In contrast to the fixed scaffoldings, are the optional scaffoldings, which are characterized by being available in the computational environment in the form of help tools, on which students have been previously informed so that they use them according to their learning needs. These tools have the capability of respecting individual differences and in theory, they empower the student so that they decide when to use them or not (Cagiltay, 2006; Lakkala et al., 2005).

There is no consensus among the academic community regarding the use of scaffoldings of a fixed or optional-type, providing contradictory results in the studies. Some assert that fixed scaffoldings favor to a greater extent the development of different cognitive abilities in students; while others, report that optional scaffoldings may be ignored by students in some cases and, thus, they do not achieve the desired learning (Chang et al., 2002; Lakkala et al., 2005). Other investigations show that fixed scaffoldings do not significantly benefit the development of desired cognitive abilities (Renkl and Atkinson, 2003).

Faced with the contradictory results on the effectiveness of fixed and optional scaffoldings, it is necessary to investigate, in greater depth, the use of these two types of scaffoldings when they support students in achieving different cognitive abilities.

Regarding the foregoing, different studies propose the use of metacognitive scaffoldings to support students in the classroom when interacting in computational scenarios. Li and Lim (2008) researched the impact of two types of scaffoldings: one fixed and the other adaptive, which provided support to students when they performed information Web searches. The study was conducted with seventh-grade students.

In the fixed scaffolding, novices used a template that guided the information search. It contained explicit instructions to perform searches. The template allowed the student to choose the search topic through keywords. Similarly, it offered appropriate search engines to perform the search; thus, it got the student to provide an answer to the assigned task. On the contrary, in the adaptive scaffolding, the search was guided by an expert teacher who allowed the students to work in pairs to solve the task. The obtained results showed that the fixed scaffolding offered better results in the development of information search tasks than the adaptive scaffolding since working in pairs hindered the structured synthesis of information.

In another study, Zhang and Quintana (2012) designed and validated a metacognitive scaffolding of a fixed-type, with the purpose of supporting information Web search processes. The scaffolding was tested with 16 sixth-grade students, which were divided into two groups. The first group performed information searches with the help of the scaffolding independently and the second group searched for information on the Internet in the traditional manner without teacher supervision. The results of the implementation were gathered through videos and conversations between students. Based on these evidences, it was concluded that the use of scaffoldings improved the efficacy of information Web searches since students easily saved and recovered information, systematically conducted their searches, and focused their attention on task development;
situation that probably allowed avoiding distractors and developed their metacognitive abilities (Zhang and Quintana, 2012). (Graesser et al., 2007)

Regarding critical thinking, studies exist that show the impact of scaffoldings on critical views and metacognitive abilities. For example, Graesser, Wiley, Goldman, O’Reilly, Jeon, and McDaniel (2007) researched the impact of a Web tutor called SEEK on the development of critical views through planning, monitoring, and reflection in university students. Students had to explore different Web pages in order to inquire the causes of a volcanic eruption during approximately two hours of work. The study’s results did not have a positive impact on the development of critical thinking or on planning, monitoring, and reflection. Researchers concluded that due to the short interaction time with the Internet, the desired results were probably not found; therefore, they propose improving the scaffolding in terms of training, quality, and interaction quantity; thus, evidencing significant changes related to the development of critical views in students in science-specific subjects.

In a more recent study, Kuo, Chen, and Hwang (2014) designed a fixed computational scaffolding called Meta-Analyzer. It implemented an information Web search strategy. Eighty university students, which were randomly assigned to one experimental and another control group, participated in the study. The experimental group searched for information with the support of the scaffolding and the control group searched content in a conventional manner. Based on the results, it was possible to establish that the experimental group students exhibited better performances in task achievement, while at the same time developing structured abilities to perform Web searches, in comparison to the control group. According to the study, novices that interacted with Meta-Analyzer developed critical thinking abilities. (Kuo, Chen and Hwang, 2014)

In sum, the presented studies allow concluding that the design of metacognitive scaffoldings for information Web searches constitute a research field worthy of being studied in-depth since they are considered as a possible alternative when supporting information search processes in students with different schooling levels (Kuo et al., 2014; Lee, 2005).

3. Method

3.1 Design

The research follows a quasi-experimental design with three groups of tenth-grade students, previously established, from a private school of Bogotá D.C. – Colombia. As the study’s independent variable, is a b-learning environment with three values: one group that interacted with a b-learning environment that included a fixed Metacognitive Scaffolding for Information Search (MSIS), another group worked with the b-learning environment, where MSIS use was optional, and a third group that interacted with the b-learning environment without any type of scaffolding whatsoever.

The study’s dependent variable was the development of metacognitive abilities, which has two values: 1) metacognitive knowledge (declarative knowledge, procedural knowledge, and conditional knowledge) and 2) metacognitive regulation (planning, organization, monitoring, control, and evaluation). As co-variable, is the metacognitive ability pretest. The research’s data were analyzed through a MANCOVA and a Bonferroni contrast. Both tests were performed through the Statistical Package for the Social Science (SPSS) 20.0 software.

3.2 Participants

The research was conducted with a sample of 104 students (61 women and 43 men) from the tenth grade of a private school of the city of Bogotá D.C., located in the locality of Engativá. The ages ranged between 13 and 17 years (Mean=15.11 years, Standard Deviation=0.72). The number of students in each one of the tenth-grade courses is shown in table 1.
Table 1: Number of students that participated in each one of the courses

<table>
<thead>
<tr>
<th>Scaffolding (MSIS)</th>
<th>Number of students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Scaffolding</td>
<td>40</td>
</tr>
<tr>
<td>Optional Scaffolding</td>
<td>34</td>
</tr>
<tr>
<td>Without Scaffolding</td>
<td>30</td>
</tr>
<tr>
<td>Total</td>
<td>104</td>
</tr>
</tbody>
</table>

3.3 Instruments

3.3.1 Metacognitive Awareness Inventory (MAI)

To determine students’ metacognitive abilities, a MAI test was employed (Schraw and Moshman, 1995). The instrument allows identifying subjects’ metacognitive abilities through 52 items, distributed in two components, namely: metacognitive knowledge and metacognitive regulation.

Metacognitive knowledge refers to the knowledge that a subject has on his or her own knowledge. This component has three subcategories: declarative knowledge, procedural knowledge, and conditional knowledge. On the other hand, the second component, that is to say, metacognitive regulation, refers to the activities that allow controlling learning. It has five subcategories: planning, organization, monitoring, control, and evaluation.

Planning relates learning goal and necessary resource assignment as a function of the desired goal. On the other hand, organizing considers the abilities and strategies that a person uses efficiently when developing learning tasks. Regarding monitoring, this refers to the level of supervision that the novice performs on their learning process or, of the strategies used during task development. Control has to do with the process through which the subject identifies learning weaknesses and adjusts the strategies to improve their performance and the effectiveness of the strategies implemented after a lesson.

MAI is a self-report questionnaire with a Likert scale using the following statements: 1. Strongly disagree, 2. Disagree, 3. Neither agree nor disagree, 4. Agree, and 5. Strongly agree. This instrument is validated in the Spanish language with Colombian students and evidences a good level of internal consistency, with a Cronbach’s alpha =0.94. (Huertas, Vesga, and Galindo, 2014). In the present research the instrument had a Cronbach’s alpha =0.90.

3.3.2 Metacognitive Scaffolding for Information Search (MSIS)

MSIS was developed in Hypertext Preprocessor (PHP) 5.3.26 language, it used a MySQL 5.5.37 database, and it was installed in a Web Apache 2.2.25 server. The interface was elaborated with HTML5, CSS3, and Jquery. The video aids were created in mp4 format, characteristics that allow the tool to adapt to virtual learning environments like Moodle. The scaffolding’s architecture was built based on the elements proposed by Hadwin and Winne, in their self-regulation learning model, which has a high metacognitive component (Hadwin and Winne, 2001).

The scaffolding was designed and implemented within the structure of a hypermedia scenario, which was used in the blended learning modality. In other words, it combined the student’s autonomous work outside of the classroom and face-to-face classes. This modality is a hybrid educational system, in other words, it combines aspects of face-to-face education and information technologies-based instruction (Chafiq et al., 2014; Köse, 2010; Pektas and Gürel, 2014). The hypermedia environment contains theoretical elements, examples, and exercises on general chemistry. Additionally, it has technological resources, such as: videos, animations, and photographs, among others. The software consists of eight learning modules and was built in the Moodle platform.

MSIS’s objective is to offer support to students that perform information Web searches. Following this line of thought, the scaffolding has structured guidelines based on metacognition for the development of search tasks (Hadwin and Winne, 2001; Kim and Hannafin, 2011). The different stages that make up the metacognitive scaffolding are described below.
Stage 1. Knowledge Judgments: In this stage, the scaffolding introduces the student to the information Web search task with the purpose of getting them to reflect on and assess their prior knowledge on the topic of query (declarative, procedural, and conditional knowledge). Similarly, it performs a detailed description of the stages of the information search process, which correspond to planning, execution, and evaluation (figure 1) (Kwon, Hong and Laffey, 2013; Li and Lim, 2008). This information allows the student to reflect on the state of their current knowledge and prepares them for the next stage.

Figure 1: Reflection and knowledge judgment stage

Stage 2. Search Planning: During this stage, the novice designs a work plan for the information Web search based on the following aspects: choosing a learning goal that guides their actions and acts as a reference point. Time spent on the information search process, for which the scaffolding offers the student four options: one of 30 minutes, others of 60, 90, and 120 minutes. It also questions them on their prior knowledge of the subject of the search task, for which the student is requested to indicate on a scale their level of knowledge.

On the other hand, the scaffolding offers the student five keywords on the search subject and presents them with three options to perform the information query. These options are: search engines (Google, Bing, and Yahoo), Web pages (Online teacher, Biology hypertexts, and Icaro), and finally, open access databases (Network of Scientific Journals of Latin America and the Caribbean-Redalyc and Directory of Open Access Journals-DOAJ) (Yelland and Masters, 2007; M. Zhang and Quintana, 2012).

To promote metacognitive monitoring in this stage, the section called “Thinking about my planning” was designed. There, the scaffolding, presents a synthesis of the planning and requests the novice to indicate if they agree with or want to modify the established items. This situation leads the student to reflect on the planning done.

As observed, planning has the objective of preparing the student, conscientiously, for the development of the information search task in an organized and structured fashion and, at the same time, it favors the capacity of monitoring, evaluating, and controlling the aspects proposed in this stage. Once this process has been completed, the student must face the next stage, which corresponds to search execution (Kim and Hannafin, 2011; Molenaar et al., 2010; Poitras, Lajoie, and Hong, 2012) (Figure 2).

Stage 3. Search Execution: This stage begins with the information search of the chosen sites (search engines, Web pages, and databases) (Stronge, Rogers and Fisk, 2006; Thatcher, 2006). The scaffolding requests the novice to choose three reliable pages in accordance with the information search objective. If the pages contain the desired information, the scaffolding saves the Uniform Resource Locator (URL). Otherwise, it indicates that they must consult a new source of information. This aspect corresponds to the actions of monitoring and control that the scaffolding offers the novice with the objective of creating, in them, attitudes of reflection and control regarding their actions (figure 3).
Figure 2: Planning of and reflection on the information Web search

Figure 3: Information search planning
Once the process of choosing the search sites has been completed, the student analyzes and synthesizes the information found in order to answer the task (Mannheimer, 2010; M. Zhang and Quintana, 2012). This information search stage has a text editor for the student to synthesize the selected content and answer the search task.

At the end of the synthesis of information, the scaffolding offers the student the possibility of performing metacognitive monitoring of the completed activity through the section “Supervising my learning task”, which has the objective of identifying the level of comprehension and depth reached in the revised content. If the student considers that they did not achieve the purpose, they can perform a new information Web search in order to reach a greater level of comprehension of the concepts studied (figure 4).

Finally, the scaffolding presents a series of metacognitive questions, which must be evaluated based on an established scale. According to the score obtained, the scaffolding offers feedback and proposes control actions, such as: improve the answer’s wording, elaborate on and complement the task’s answers, employ resources such as drawings or graphs that improve subject matter comprehension as a function of the achievement of learning goals (Fund, 2007; Scherer and Tiemann, 2012).

**Figure 4: Synthesis of selected content**

Stage 4. Evaluation of Search Results: this stage has the intent of getting the student to reflect on the progress so far in answering the learning task. In this sense, the student is forced to reflect on the achievement of the learning goal according to their expectations. Similarly, they evaluate if the time established to perform the search was enough; finally, they question if the selected strategy for the information search was effective (see figure 5).
Likewise, in this stage the MSIS allows the student to download the learning task and send it to the teacher for their corresponding evaluation. Once the teacher has revised the task, the feedback and observations are sent to the student’s email so that they take actions guided towards improving the next information search.

![Evaluation of Search Results](image)

**Figure 5:** Evaluation of Search Results

### 3.4 Procedure

For the development of the study, the school’s board was contacted and after presenting them with the project, they allowed the implementation of the research with the tenth-grade students. Subsequently, students were invited to participate in the study by explaining the study’s benefits in terms of desired learning, situation that resulted in students’ acceptance; in addition, parents were requested to authorize their children’s participation in the study, informing them, at the same time, that the results would be managed confidentially and were for research purposes.

Before the start of the study, users and passwords were created so that students could access the Moodle platform. While conducting the research, weekly face-to-face meetings were carried out with the novices and teachers during chemistry period.

During the face-to-face classes, the teacher explained to students conceptual aspects of the different chemistry topics through examples and exercises. In these sessions, students browsed through the scenario implemented on the Web. At the end of the class, the teacher assigns the task to be completed by the students, which should be completed through information Web search. This task was worked on during out-of-class schedules and was available on the Moodle platform. Tasks completed by the students were sent weekly to the teacher through the same platform.

Once the teacher received the task, its corresponding evaluation was conducted and feedback was provided through each student’s email. Similarly, in the next class, the teacher made observations according to student’s answers. The completion of each one of the eight learning modules followed the same procedure.
To monitor the study, a private domain was acquired (http://aulavirtual.adrianahuertas.co), which was used by students during the academic semester. The Moodle platform contained three courses in which the students enrolled. Each course presented the same educational resources, but differed in the scaffolding to be used. To that effect, a group of students had a fixed-type scaffolding, which was permanently showed to students through the platform and during the Web information search. Another group had an optional scaffolding, which was presented as a “help” option in the platform during the information search, and students could choose whether to use it or not. A third group corresponded to the control group, which did not use MSIS.

4. Findings

A MANCOVA was applied to the results obtained from the research. From this analysis, it was established that in the category of metacognition knowledge the resulting models have a high level of prediction of the different observed variables. The model explains a 68.3% of the variance in “declarative knowledge”. It is followed by the “procedural knowledge” variable, with a 57.3% of the total variance. Lastly, is found “conditional knowledge” with a 57.1% of the total variance.

The results show that the declarative knowledge co-variable (pretest) has a significant association only with declarative knowledge (posttest); \((F(1,98) = 120.05; p < 0.001; \eta^2=0.551)\). The procedural knowledge co-variable (pretest) has a statistically significant effect on procedural knowledge (posttest); \((F(1,98) = 55.65; p < 0.001; \eta^2=0.362)\). The conditional knowledge co-variable (pretest) has an effect on procedural knowledge (posttest); \((F(1,98) = 75.38; \eta^2=0.435)\). Finally, it can be observed that the independent variable MSIS has a significant effect only on procedural knowledge \((F(2,98) = 3.22; \eta^2=0.062)\).

Regarding the resulting models in the metacognitive regulation category, the variable that has greater variance explained is “planning”, which achieves predicting 82.9%. In second place, “monitoring”, with a 77.0% of the total variance. In third place, “organization”, with a 74.4% of the total variance. In fourth place, “evaluation”, with a 73.3% of the total variance. Lastly, “control” with a 68.7% of the total variance.

The results of the metacognitive regulation category show that all the co-variables exhibit significant associations with the final state of the same variable. Regarding the independent variable MSIS, it could be established that it has a significant effect on planning \((F(2,96) = 30.04; p < 0.001; \eta^2=0.385)\), organization \((F(2.96) = 13.17; p < 0.001; \eta^2=0.215)\), monitoring \((F(2,96) = 8.81; p < 0.001; \eta^2=0.155)\), and evaluation \((F(2.96) = 14.68; p < 0.001; \eta^2=0.234)\).

The results of the MANCOVA analysis are shown in figure 6, where it can be observed that the independent variable MSIS has a significant statistical effect on the development of subjects’ metacognitive abilities in five categories of the MAI instrument (procedural knowledge, planning, organization, monitoring, and evaluation).

![Figure 6: Estimated marginal means for the work with MSIS and the control group](image-url)
It can be appreciated that the students that used the fixed scaffolding as support to answer their information search tasks obtained better results in the MAI test than the students that used the optional scaffolding and the students that did not have MSIS.

With the purpose of exploring, in greater detail, the relationship of the scaffolding with the development of metacognitive abilities in students, a complementary analysis through a Bonferroni contrast was conducted (Table 2).

Table 2: Procedural Knowledge Bonferroni Contrast

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>(I) MSIS</th>
<th>(J) MSIS</th>
<th>Mean Difference (I-J)</th>
<th>Std. Error</th>
<th>Sig.</th>
<th>95% Confidence Level for the difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lower Bound</td>
<td>Upper Bound</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post Procedural Knowledge</td>
<td>Optional Scaffolding</td>
<td>Control Group</td>
<td>-0.04</td>
<td>0.13</td>
<td>1</td>
<td>-0.36</td>
</tr>
<tr>
<td></td>
<td></td>
<td>With Fixed Scaffolding</td>
<td>-0.31*</td>
<td>0.12</td>
<td>0.058</td>
<td>-0.61</td>
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<tr>
<td></td>
<td>Control Group</td>
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<td>0.13</td>
<td>1</td>
<td>-0.28</td>
</tr>
<tr>
<td></td>
<td></td>
<td>With Fixed Scaffolding</td>
<td>-0.26</td>
<td>0.13</td>
<td>0.18</td>
<td>-0.59</td>
</tr>
<tr>
<td></td>
<td>With Fixed Scaffolding</td>
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<td>0.31*</td>
<td>0.12</td>
<td>0.058</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Control Group</td>
<td>0.26</td>
<td>0.13</td>
<td>0.18</td>
<td>-0.06</td>
</tr>
</tbody>
</table>

In Table 2, the results of the Bonferroni contrast test evidenced that significant differences exist in procedural knowledge between students that interacted with the fixed and optional scaffolding. Similarly, it evidenced that no significant differences exist between the control group and the group that optionally used MSIS. In other words, these two groups are equivalent in the results with respect to procedural knowledge.

Table 3 presents the Bonferroni contrast with respect to metacognitive regulation. The test establishes significant differences in the following subcategories: planning, organization, monitoring, and evaluation between students that interacted with the fixed and optional scaffolding and between those that searched for information with help of the fixed scaffolding and the control group (p<0.05). There were no significant differences between the control group and the group that worked with the optional scaffolding.

Table 3: Metacognitive Regulation Bonferroni Contrast

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>(I) MSIS</th>
<th>(J) MSIS</th>
<th>Mean Difference (I-J)</th>
<th>Std. Error</th>
<th>Sig.</th>
<th>95% Confidence level for the difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lower Bound</td>
<td>Upper Bound</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post Planning</td>
<td>Optional Scaffolding</td>
<td>Control Group</td>
<td>-0.04</td>
<td>0.09</td>
<td>1.000</td>
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</tr>
<tr>
<td></td>
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<td>Fixed Scaffolding</td>
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<td>Control Group</td>
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<td>-0.18</td>
</tr>
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<td></td>
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<tr>
<td>Post Organization</td>
<td>Optional Scaffolding</td>
<td>Control Group</td>
<td>-0.09</td>
<td>0.09</td>
<td>1.000</td>
<td>-0.33</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fixed Scaffolding</td>
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<td>0.09</td>
<td>0.000</td>
<td>-0.62</td>
</tr>
<tr>
<td></td>
<td>Control Group</td>
<td>Optional Scaffolding</td>
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<td>0.09</td>
<td>1.000</td>
<td>-0.15</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>-0.33</td>
<td>0.09</td>
<td>0.003</td>
<td>-0.56</td>
</tr>
</tbody>
</table>
5. Discussion and Conclusions

It can be concluded from the research conducted that the implementation of MSIS, in the fixed version, within a course carried out in the blended learning modality to teach chemistry to tenth grade students, favors the development of metacognitive abilities when they perform information Web search processes. The results were contrary to that expected, insofar as the hypothesis posited was that the students that interacted with the version of the optional scaffolding would have significantly higher results in the development of metacognitive capacity than those who interacted with the version of the fixed scaffolding. The findings by components and categories according to the MAI test are described below.

With respect to cognition knowledge, the results allow establishing that students improved their performances in the procedural knowledge category. That is to say, they developed the capacity of establishing a sequence of structured steps to perform information Web searches. This situation favored the effective search of content to answer learning tasks. In this sense, the use of MSIS, in the fixed condition, allowed students to consolidate structured strategies to perform information Web searches.

However, in the declarative and conditional knowledge categories, the use of MSIS, both fixed and optional-type, regarding the control group, did not exhibit statistically significant differences. This, probably, because the metacognitive scaffolding had a clear intent to induce the novice to the strategy of how to implement a structured information Web search and not of guiding him in a process that favored declarative and conditional knowledge.

This leads to the conclusion that, probably, to improve declarative knowledge in the student, it is necessary to make technical improvements to the MSIS scaffolding. Improvements oriented towards providing the novice with tools that make it easier for them to identify their strengths and weaknesses with respect to the necessary abilities to process information and search for social, time, and space resources required when facing learning tasks that imply information web searches. Including these variables in MSIS would probably lead the student to get to know him or herself better and to be realistic about their expectations.
On the other hand, it is necessary to make technical improvements to MSIS in order to support and favor conditional knowledge. This, insofar, if the scaffolding offered a flexible structure to present different information search strategies to the student, they would probably be capable of making decisions on when and why to use one or another strategy. This suggests that the MSIS scaffolding must incorporate different components to favor all the metacognitive knowledge categories.

With regards to metacognitive regulation, the use of MSIS involved significant differences in the planning, organization, monitoring, and evaluation categories. With respect to planning, it is possible to infer that the students that interacted with MSIS, in the fixed version, where more precise when establishing learning goals, proposed times for the development of the information searches, the use of keywords, and document selection to answer the tasks. Probably, the fact of planning the activities prior to performing the information Web searches, in each one of the eight learning modules, favored the development of this capacity; essential element of metacognition.

Regarding organization, it is possible to deduce that the students that used the MSIS, in the fixed version, developed efficient strategies to perform the information Web search tasks. The scaffolding allowed the students to systematically and in an organized fashion select the search sites (search engines, recommended pages, and databases), establish keywords, and the manner how to analyze and synthesize the information for the development of the learning task.

Similarly, MSIS allowed students to monitor the progress of the different activities during the information search process in order to develop their capacity to supervise their own learning process. This process was achieved through pop-up windows, which presented a summary of the decisions taken and reflection after each completed activity. Possibly, this offered feedback favored the self-observation process during task development.

With respect to the evaluation process, it is possible to establish that the MSIS scaffolding, in the fixed version, showed a positive impact since, in the final reflection stage of each one of the learning modules, the novice was questioned about the task’s quality, the activity planning, the time employed, and the goal achievement. The scaffolding allowed the students to conduct an analysis of the performance and effectiveness of the implemented strategy. In general terms, it is possible to assert that the results obtained in this study are consistent with previous research, which discuss that fixed scaffoldings can favor, to a greater extent, students’ metacognitive capacity (Huertas, Vesga, Vergara and Romero, 2015; Li and Lim, 2008; M. Zhang and Quintana, 2012).

It is noteworthy, on the other hand, that the control category did not show significant changes when adjusting or changing the strategies chosen for the information Web search. In view of this fact, it is possible to assert that in spite of the students systematically monitoring their information search process in the task development, they were incapable of taking concrete actions to change or adjust those strategies, which were not in accordance with the expected results.

In light of this aspect, the scaffolding requires technical improvements oriented towards including in the MSIS tools that allow students to make the necessary adjustments when establishing the strategies to improve their performance, as a function of the goals reached. This improvement must be articulated with the aforementioned cited. This would probably help the student take concrete control actions regarding the information search process.

From the research conducted, it was expected to find that students that interacted with the optional scaffolding version would exhibit a higher level of development in metacognitive abilities than those obtained by the students in the fixed version. These results concur with the findings of Chang et al., 2002 and Lakkala et al., 2005, who found that students sometimes ignore optional scaffoldings. In this sense, the behavior of the students from the group that had the option of using MSIS was similar to the control group. It was evident that this group used the scaffolding in a low percentage, in spite of the knowledge they had of its existence and advantages. The data show that its use did not exceed 23.52% in each one of the courses’ unit lessons. Students were expected to decide, by their own initiative, to use the scaffolding differentially, which is to say, that it be used to fit their learning needs.
According to the results obtained, it is possible to assert that the MSIS scaffolding effectively guided the student in the information search for its subsequent analysis. With this type of aid, the novice had to answer their learning tasks in a structured manner, avoiding copying and pasting the information viewed on the Web. Similarly, the scaffolding reduces the problem of disorientation that students may experience when browsing the Web by avoiding distractions or ineffective searches.

It would be convenient that in future applications, the scaffolding, in a first stage, be fixed so that the student familiarizes themselves with its advantages. Next, in the remaining modules, it is suggested that the scaffolding be optional; thus, the student has the capacity to decide whether to use it, or not, in their information Web searches. Possibly, the results could vary. This suggests that different experiments should be conducted with the optional scaffolding versions in order to obtain greater comprehension on their use and implementation since not all students need the same type of support during the different unit lessons. When the scaffolding is implemented in the same manner for all students, students’ differences and individual learning needs are not taken into account and, probably, equitable support is not being provided to aid their own learning process.

On the other hand, the use of blended learning scenarios allows teachers to use information technologies inside the classroom as a pedagogical and/or didactic strategy supporting students’ learning. This work modality probably provides students with opportunities to practice and develop metacognitive abilities in a structured fashion. Thus, high school students would achieve developing autonomy abilities in learning, situation that involves them being more responsible when monitoring and controlling their own learning process as they advance from one module to another.

Finally, the findings contribute empirical evidence on the use of scaffoldings in b-learning environments. This learning strategy, possibly, allows preparing high school students to effectively and autonomously face e-learning courses. Similarly, they would be capable of undertaking the challenge of the requirements that university education implies.

6. Limitations and Suggestions for Future Research

Regarding the use of the optional MSIS scaffolding, it could be suggested that in the first work sessions students mandatorily use a scaffolding and, after this experience, let them decide for themselves whether they use it or not to continue with the development of the learning tasks. This is probably more beneficial for the student insofar as they would be autonomous when deciding on continuing with or without the implemented aid when interacting with computational environments. This would allow analyzing in-depth the advantages and disadvantages of its use during the development of different abilities.

It would be interesting, in future research, to establish the manner how the learning achievement of students that interacted with MSIS is affected and its possible relationship with other psychological variables related to cognitive and learning style, in line with a flexible and equitable education, which respects individual differences, when students interact with computer-based learning scenarios.

It is important to mention that by using a b-learning environment in the research, it is possible that variables may arise that were not controlled in the study; such as the interaction between peers during the development of a learning task, aspect that could be studied furthered in subsequent research. Also, time control for the development of learning tasks, which was not systematically recorded. The study of this variable, regarding time management, would open a research area with regards to self-regulation of learning and the monitoring of set goals. Finally, it would be interesting to study students’ motivation toward online learning; variable that could be analyzed in-depth in high school students with the purpose of preparing them to undertake the challenge of continuing with university studies supported by mobile technologies.

References


www.ejel.org

ISSN 1479-4403
Developing Reflective Skills of Student Teachers in the Virtual Learning Environment

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Abstract: A technology supported environment in the educational context has been identified as a useful work space with the potential to deepen the learning experience. This study focuses on ways of using it for the development of reflection as a key teaching competence within initial teacher training. It is based on the premise that enriched reflection conducted in a technology supported environment will result in more a specific, more profound and thus deeper learning experience of student teachers. The purpose of this study was to measure the level of depth of the reflection conducted in a regular higher education ELT methodology course after a microteaching session and to compare it with the reflection student teachers provided after their experience had been enriched by other classmates’ suggestions within VLE. The study was conducted over 2 semesters and the research sample consisted of 52 undergraduate students. Non-probability sampling was applied, namely convenience sampling. Both qualitative and quantitative methods were used including content analysis and semi-structured focus-group interviews. To increase the internal validity and objectivity in coding the responses and data interpretation multiple researchers were used. The results of the current study suggest that enriched reflection provided student teachers with such a depth of stimuli that their approach towards their own reflection demonstrated a significant difference in comparison with regular reflection conducted in face to face learning.

Keywords: technology supported environment, virtual learning environment, higher teacher education, reflective practice, enriched reflection

1. Introduction

Education has been the focus of technological interventions for quite some time with a variety of aims (see e.g. Kirkwood and Price, 2013). The term technological intervention or enhancement can refer to multiple uses of technological devices applied in the educational context with the focus placed on the learner or the learning process. The prime intention for this enhancement in general is usually to raise the quality of the teaching/learning process within many different aspects of this process. This study investigates how technological enhancement through the use of virtual learning environment (VLE) can improve the reflective skills of student teachers by creating space for collaborative learning experience in initial teacher training courses.

Teacher education needs to create sufficient space for such aspects of the teaching profession which do not manifest themselves on the overt level. Decision-making processes, justification of chosen techniques, tendencies to operate on certain communication principles are rather subtle processes which teachers are not always aware of or able to articulate. The way of disclosing them requires conditions which are not always easy to set in the context of face to face learning. Virtual learning environment, on the other hand, has the potential to create more desirable conditions, especially for reflection which requires time and space and, moreover, frequent repetition. As Gün (2011) suggests reflection if practised systematically can be developed more effectively.

This paper addresses the issue of using virtual learning environment for the development of reflective practice and it particularly focuses on whether reflection becomes more effective if an online learning environment is incorporated in the training and on the perceptions of student teachers towards the e-learning component of their course.

2. Reflective practice in teacher training

The development of reflection as a part of complex metacognitive awareness has an irreplaceable position in teacher education (e.g. Richards and Lockhart, 1994; Spijková, 2007; Gough, 2007; Pollard and Collins, 2008) since it allows the space for reconsideration of prior beliefs which are deeply embedded and sometimes even difficult to express. Although there are many different viewpoints on what exactly we should define as reflective practice (Walsh and Mann, 2015) and its application would most certainly vary in the way how reflection interweaves teacher training courses, one thing is acknowledged by all of these approaches. Reflection is the key aspect in building a teaching self and developing the constant need for professional
development (Marzano, et al., 2012). It is, therefore, essential to equip future teachers, already in the initial phase of their development, with skills that they can use independently in their own practice.

Learning from one’s own experience is a profound and focused discovery process (Dewey, 1933) which needs to be guided (Hrevnack, 2011) especially when we speak about teacher development. As Kolb (1984) suggested in his experiential learning cycle, thinking about past actions, searching for the reasons why certain things happened and why the teacher opted for specific actions is crucial in understanding the core of the action and thus brings future results to a higher qualitative level. However, individual reflective observations might not always produce such conclusions. The individual holds on to prior knowledge and prior experience both of which seem to have a strong influence on how the new reality is going to be filtered, assessed and adjusted within the already existing schematic knowledge. It, therefore, opens the space for “other people’s observations” or enriched reflection (Ur, 1996, p.7) in order to bring about confrontation with other people’s realities to allow for justification, searching for solutions to stated problems. As DeWitt, et al. (2017) suggest the learning experience conducted through responding to stimuli and through constant interactions with peers activates and engages learners, providing a deeper learning experience. A qualitative study by Lee (2005) supports the idea of group reflective thinking pointing to the fact that if students are equipped with proper “collaborative reflection-supporting tools” it has a positive impact on their reflective outcomes. Lee (ibid.) underlines especially the facilitative aspects of collaborative reflection which are also the main focus of this study. Collaboration of peers seems to stimulate a higher quality of outcomes (Qin, Johnson and Johnson, 1995; Turcotte, 2012) and it generates much higher stimuli for the reflection process in comparison with a situation where the task is handled by an individual. This diversity of viewpoints generates deeper immersion and involves higher-order thinking skills, which allows student teachers to move from a descriptive approach in reflection into a deeper analytical approach.

Execution of learning tasks within the online learning environment and the use of technology for collaborative purposes allows for extended space and sufficient time for observation, reflection, forum-discussions, i.e. conditions in which student teachers have more opportunities to undergo the analytical process of what happened in the classroom experience context.

DeWitt, et al. (2017) highlight that one of the aspects of collaborative learning is that it enables participants to bring their prior knowledge and perspectives and share them within the community as a result of social interactions. If this is conducted in virtual environments e.g. in discussions, or feedback sessions, the participants need an awareness of belonging to the community, demonstrating a supportive attitude to peers participating in discussions. A thorough investigation of collaborative learning experience within the online environment has been conducted within the Community of Inquiry framework (Garrison and Arbaugh, 2007; Arbaugh, et al., 2008; Swan, Garrison and Richardson, 2009; Garrison, Anderson and Archer, 2010; Bogle, et al., 2009) with the focus on the “potential and effectiveness of computer conferencing” (Garrison, et al., 2010, p. 6). Their model of three interconnected presences (cognitive, social and teaching presence) which should involve students in a deep and meaningful learning experience and purposeful communication has been further researched in connection to new conditions and innovative approaches towards implementation of new technologies (Whiteside, 2015; Whiteside and Dikkers, 2012; Gunawardena and Zittle, 1997; Richardson and Swan, 2003; Rourke, et al., 1999).

Stepanyan, et al. (2009) conducted action research focusing on student attitudes towards peer evaluation conducted in the virtual learning environment and showed that students achieving the highest scores were most interested in studying the evaluations of their colleagues. Nortcliffe (2012), based on her five-year study of embedding formative peer feedback and self/peer assessment, states that students perceive it as a fair method. At the same time, she underlines that students need to understand that peer assessment is a means for students to reflect upon the quality of completing the required performance and/or learning outcome. Experience with assessing their peers and thinking about other students’ comments will consequently influence the way they reflect upon their own performance. This kind of approach fine-tunes the feedback of students and improves validity of their comments in comparison with those of a tutor. Bouzidi and Jaiilet (2009) support this by claiming high correlation between the tutor’s grades and students’ evaluation and similar findings were also reported by Strang (2015).

Virtual learning environment offers space for the development of individual viewpoints, which is often limited in the face-to-face classroom context. Student teachers in this context do not always manage or are willing to
take their turn in sharing their comments. On the other hand, virtual context gives them time to consider thoroughly what and how they want to respond and even compare their viewpoints with other peers. Even though this virtual context is blended into face-to-face learning for the purposes of the course, it still can increase student engagement. As Garrison states it is important to question what the e-learning component “allows us to do that we could not do before” (2011, p.6).

3. Study design

This study presents the case of student teachers who are involved in conducting reflection on their teaching. Each student teacher reflected on their performance after teaching part of the lesson in front of their peers and was given immediate feedback from the peers and the tutor. This reflection framework seemed to generate oversimplified and superficial conclusions of a rather descriptive nature (for similar results see e.g. Cohen-Sayag and Fischl, 2012) and failed to demonstrate any evidence that deep thinking and consequently learning was taking place. Even after being given structured guidance on what they needed to focus on, they had a tendency to approach it as a question-and-answer format instead of getting involved in deeper consideration of the highlighted issues. In their reflection logs, student teachers inclined towards addressing “visible” aspects of their experience in a descriptive way rather than trying to understand why things were happening. However, without deep insight into the core of how actions and reactions relate to each other in the classroom, the student teachers missed the opportunity to develop as professionals understanding the covert layers of their own teaching beliefs.

This situation led to designing a modified reflection framework in order to foster deep learning experience through collaboration with peers in a virtual learning environment. The e-learning supplement of this framework was set up with the aim of offering more space for thinking, consideration and reconsideration of ideas and at the same time of avoiding simple transition of a trainer’s ideas and viewpoints on the student teachers.

The framework included identification of the problematic situation by the student teacher and selection of problem questions connected to this situation for a collaborative forum discussion. This decision included a twofold expected outcome. The student teachers would need to first identify which part of the lesson would be selected for discussion. Secondly, the student teachers would reflect on the stimuli they receive from other student teachers and only after this phase would they prepare a final reflection report for the trainer. Both these actions were believed to prevent them from jumping to conclusions or working on the basis of first impressions.

Thus, the main aim of the present study was to investigate the possible influence of online moderated discussions in the virtual learning environment on student teachers’ ability to reflect upon their teaching performance. The study focused also on the attitudes of the student teachers towards using self-reflection as a regular part of their teaching practice and towards collaborative e-learning aspects of the Methodology course which came as a novelty for the student teachers.

The research examined:

1. whether student teachers would produce more thorough and detailed self-reflection as a result of e-learning online discussions/fora engagement
2. whether observing colleagues and providing them with VLE feedback would lead to deeper consideration of planning their own lessons
3. the attitude of the student teachers towards regular evaluation of peers’ performance, giving feedback, accepting feedback and the possible benefits of the processes.

3.1 Methodology

3.1.1 Participants

In the present research non-probability sampling was applied, namely convenience sampling where those elements are selected that are the most convenient, the most easily accessible.

The research sample consisted of 52 pre-service teacher student teachers of both genders enrolled in a teacher training MA programme at the University of Presov in Slovakia. They all studied English as a major
study programme. The student teachers voluntarily split into two groups where either classroom-based face-to-face teaching (n=29, the control group) or e-learning enhanced teaching (n=23, the experimental group) was applied.

3.1.2 Procedure

The study itself was conducted over a one-year period (2 semesters). The EFL Methodology course consists of three 39-units of study distributed over a period of 13 weeks and the student teachers take part in three school placements at both primary and secondary level.

The first semester of the Methodology course builds on the knowledge acquired in courses on general pedagogy and psychology. It focuses on building a profound understanding of the theoretical background. The next two semesters strive to transfer this understanding into classroom application and the tutors’ aim is to impart critical thinking and especially teaching skills training. During these two semesters the training is accompanied by a school placement lasting for two weeks. Student teachers are asked to keep records from the lessons they teach together with observation sheets, lesson plans and their self-evaluations.

The special course Microteaching was introduced as a reaction to student teachers’ feedback claiming they missed teaching practice and asked for more teaching experience. A safe environment and developmental attitude was also provided by clear instructions about how open but respectful feedback can help in making progress. Student teachers in the course taught two lessons (30 minutes) which were recorded. Each lesson was followed by an immediate short discussion with the participants. Student teachers who did not teach performed as learners in the lesson taught. The recording of the lesson was later uploaded to the VLE and student teachers could watch it again and focus on the areas selected by the student teacher and provide their comments and feedback. An e-forum was used to give feedback to the teaching peers (the requirement was to express both positive aspects and suggest space for improvement). The tutor monitored the feedback session and contributed only at the end summarising and supporting relevant peers’ comments and adding her own feedback and evaluation.

It should be mentioned that prior to the Methodology course they experienced 1 week of in-class observations (on average 25 hours per week) where they focused on general aspects of teaching.

3.1.3 Instruments

To address the research questions of the study, two instruments were used. The first instrument was content analysis of the online discussions and reflection sheets. They were used to examine whether and how student teachers benefit from self-reflection and online discussions about their own teaching. The data (online discussions records and self-reflections) were evaluated quantitatively and qualitatively (see below). Student teachers delivered self-reflections after their teaching performance (twice).

In the control group the lesson taught by a student teacher was discussed and analysed immediately after delivery and the student teachers submitted their self-reflection within a week in written form.

In the experimental group the lesson taught by a student teacher was recorded and uploaded to VLE. The student teachers opened a discussion in VLE giving their immediate feedback after observing the lesson recorded and possibly stated some questions. Peer-evaluation was conducted for every student teacher in the experimental group continuously.

To analyse the content of self-reflections, the data was manually coded. The initial coding (done after the first self-reflection sheets were delivered) led to setting 3 main categories further subdivided into 12 subcategories. Reviewing the codes generated consequent modification of selected categories and resulted in two main categories (feedback about students and their performance; feedback about the teachers and their performance) and 17 subcategories (in the statistics and graphs labels with index B or A to identify the time of measurement: B – (before the intervention) first self-reflection; A (after the intervention) second self-reflection report).
1. **Feedback about students**
   1. Performance
   2. Behaviour
   3. Ability to cooperate
   4. Use of first language
   5. Problems with grammar

2. **Feedback about teachers**
   1. Lesson structure
   2. Activities
   3. Time management
   4. Interaction patterns
   5. Teaching strategies
   6. Giving instructions
   7. Checking understanding
   8. Giving feedback
   9. Lesson planning
   10. Accuracy, fluency and appropriacy of language
   11. Materials
   12. Assessment

The decision to set two different categories, namely feedback about students and feedback about teachers, was based on our prior experience. We faced the situation in which students in their self-reflection reports had the tendency to evaluate the learners, their performance and behaviour, instead of thinking about their own teaching, their own performance and behaviour (does not matter whether in a positive or negative way). They frequently described (rather than analysed) what happened in the class from the teachers’ perspective, they did not consider or suggest possible alternative solutions and ways to make the lesson more effective or interesting, motivating. It often occurred of lesson failure without objective self-reflection. Such division enabled us to focus on a possible shift after the intervention, which could tell us more about the focus of student teacher attention.

To increase internal validity, objectivity in coding the responses and data interpretation multiple researchers were involved. The differences in coding were resolved through discussion. Inter-rater reliability was calculated to test the agreement between the raters. Statistical tests were run individually for the results before intervention and after intervention measurements. The sums of two main categories (feedback about students and feedback about teachers) were compared for each subject individually. Intra-class correlation (ICC) statistics was selected as we worked with continuous data. The interclass correlation coefficient indicated excellent agreement between the two raters as can be seen in the tables below.

**Table 1:** Inter-rater reliability test results – before intervention

<table>
<thead>
<tr>
<th>Item-Total Statistics</th>
<th>Scale Mean if Item Deleted</th>
<th>Scale Variance if Item Deleted</th>
<th>Corrected Item-Total Correlation</th>
<th>Squared Multiple Correlation</th>
<th>Cronbach's Alpha if Item Deleted</th>
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<tr>
<td>A1B</td>
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<td>.848</td>
<td>.</td>
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<table>
<thead>
<tr>
<th>Scale Statistics</th>
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<th>Variance</th>
<th>Std. Deviation</th>
<th>N of Items</th>
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</thead>
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<td>7.69</td>
<td>11.244</td>
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</table>
Intraclass Correlation Coefficient

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<th>F Test with True Value 0</th>
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<tr>
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<td>Upper Bound</td>
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<td>.868</td>
</tr>
<tr>
<td>Average Measures</td>
<td>.959</td>
<td>.939</td>
</tr>
</tbody>
</table>

Two-way mixed effects model where people effects are random and measures effects are fixed.

a. The estimator is the same, whether the interaction effect is present or not.
b. Type A intraclass correlation coefficients using an absolute agreement definition.
c. This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

Table 2: Inter-rater reliability test results – after intervention

<table>
<thead>
<tr>
<th>Item</th>
<th>Scale Mean if Item Deleted</th>
<th>Scale Variance if Item Deleted</th>
<th>Corrected Item-Total Correlation</th>
<th>Squared Multiple Correlation</th>
<th>Cronbach’s Alpha if Item Deleted</th>
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<td>.861</td>
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</tr>
<tr>
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<td>5.135</td>
<td>.928</td>
<td>.861</td>
<td>.</td>
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</tbody>
</table>

Scale Statistics

<table>
<thead>
<tr>
<th>Mean</th>
<th>Variance</th>
<th>Std. Deviation</th>
<th>N of Items</th>
</tr>
</thead>
<tbody>
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<td>6.54</td>
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Intraclass Correlation Coefficient

<table>
<thead>
<tr>
<th></th>
<th>95% Confidence Interval</th>
<th>F Test with True Value 0</th>
</tr>
</thead>
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<td>Lower Bound</td>
<td>Upper Bound</td>
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<tr>
<td>Average Measures</td>
<td>.963</td>
<td>.942</td>
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</tbody>
</table>

Two-way mixed effects model where people effects are random and measures effects are fixed.

a. The estimator is the same, whether the interaction effect is present or not.
b. Type A intraclass correlation coefficients using an absolute agreement definition.
c. This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

The inter-rater agreement before intervention was .959 and after intervention we recorded similarly excellent agreement .961.

The length (measured in words) of the self-reflection was considered as an indicator of space and time devoted to deeper thinking. Despite understanding that time in this case might be a rather relative concept it was accepted as an indicator for comparing experimental and control groups.

The second instrument involved a set of pre-formulated questions for a focus-group interview. Topics and issues were specified in advance; the structure was set in advance as well with the aim of minimising unrelated responses and thus to increase their comparability; yet researchers could develop the discussion and ask additional questions based on observations.

3.2 Results

Even though the aim of the study was to gain primarily qualitative data, we decided to convert them into quantitative data, which enabled us to run the statistical tests and to evaluate the progress of both experimental and control groups. We also compared individual variables (coded categories) between the experimental and control group after the experiment (see Table 6).
The coders identified more than 740 references to 17 themes discussed within more than 100 instances of feedback. Levene’s test was used to test if samples have equal variances. The homogeneity of variance was confirmed.

Table 3: Levene’s test of homogeneity of variances (variable number of words)

<table>
<thead>
<tr>
<th>NUMBER OF WORDS</th>
<th>Levene Statistic</th>
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<th>df2</th>
<th>Sig.</th>
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<td></td>
<td>1,723</td>
<td>1</td>
<td>50</td>
<td>.195</td>
</tr>
</tbody>
</table>

a. time = B

Both control and experimental groups generally focused their attention on the same aspects; mostly on the students’ performance and behaviour in their first reports. The length of their reports was similar (see Figure 1). The average number of words in the control group was 327.5 words and 335.9 in the experimental one and there was no significant statistical difference recorded (p=0.106).

Significant progress was recorded in both groups. In the control group the average number of words in the first self-reflections was 327.5 and 607.3 in the second reports (with statistically significant difference, see table 4). The experimental group resulted in an average of 335.9 words in the first self-reflections which increased to 708.9 in the second reports.

Table 4: T-test for independent samples

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean Group 1</th>
<th>Mean Group 2</th>
<th>t-value</th>
<th>df</th>
<th>P</th>
<th>Valid N Group 1</th>
<th>Valid N Group 2</th>
<th>Std. Dev. Group 1</th>
<th>Std. Dev. Group 2</th>
<th>F-ratio variances</th>
<th>P variances</th>
</tr>
</thead>
<tbody>
<tr>
<td>b number of words vs. a number of words control group</td>
<td>327.48</td>
<td>607.31</td>
<td>-15.88</td>
<td>56</td>
<td>0.0000</td>
<td>29</td>
<td>29</td>
<td>55.07</td>
<td>77.28</td>
<td>1.97</td>
<td>0.08</td>
</tr>
<tr>
<td>b number of words vs. a number of words experimental group</td>
<td>335.87</td>
<td>708.87</td>
<td>-11.96</td>
<td>44</td>
<td>0.0000</td>
<td>23</td>
<td>23</td>
<td>76.17</td>
<td>128.78</td>
<td>2.86</td>
<td>0.017</td>
</tr>
</tbody>
</table>
What was most important for this study was also the statistically significant difference between control and experimental groups (see Table 6) measured after the intervention. Levene’s test was used to test if samples had equal variances before intervention. The homogeneity of variance was confirmed for all subcategories of feedback about the learners category and most of the subcategories feedback about teachers. Comparing the groups based on the sums of the subcategories of the second category shows the homogeneity of the variances as well.

**Table 5a: Levene’s test of homogeneity of variances (variable feedback from students before intervention)**

<table>
<thead>
<tr>
<th></th>
<th>Levene Statistic</th>
<th>df1</th>
<th>df2</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Performance</td>
<td>2.425</td>
<td>1</td>
<td>50</td>
<td>.126</td>
</tr>
<tr>
<td>1.2 Behavior</td>
<td>2.291</td>
<td>1</td>
<td>50</td>
<td>.136</td>
</tr>
<tr>
<td>1.3 Ability to cooperate</td>
<td>.735</td>
<td>1</td>
<td>50</td>
<td>.395</td>
</tr>
<tr>
<td>1.4 Use of first language</td>
<td>.001</td>
<td>1</td>
<td>50</td>
<td>.974</td>
</tr>
<tr>
<td>1.5 Problems with grammar</td>
<td>.013</td>
<td>1</td>
<td>50</td>
<td>.909</td>
</tr>
</tbody>
</table>

a. time = B

**Table 5b: Levene’s test of homogeneity of variances (variable feedback from teachers before intervention)**

<table>
<thead>
<tr>
<th></th>
<th>Levene Statistic</th>
<th>df1</th>
<th>df2</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 Lesson structure</td>
<td>.225</td>
<td>1</td>
<td>50</td>
<td>.637</td>
</tr>
<tr>
<td>2.2 Activities</td>
<td>.969</td>
<td>1</td>
<td>50</td>
<td>.330</td>
</tr>
<tr>
<td>2.3 Time management</td>
<td>.142</td>
<td>1</td>
<td>50</td>
<td>.708</td>
</tr>
<tr>
<td>2.4 Interaction patterns</td>
<td>8.653</td>
<td>1</td>
<td>50</td>
<td>.005</td>
</tr>
<tr>
<td>2.5 Teaching strategies</td>
<td>.</td>
<td>1</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>2.6 Giving instructions</td>
<td>26.214</td>
<td>1</td>
<td>50</td>
<td>.000</td>
</tr>
<tr>
<td>2.7 Checking understanding</td>
<td>14.898</td>
<td>1</td>
<td>50</td>
<td>.000</td>
</tr>
<tr>
<td>2.8 Giving feedback</td>
<td>23.166</td>
<td>1</td>
<td>50</td>
<td>.000</td>
</tr>
</tbody>
</table>
### Table 5c: Levene’s test of homogeneity of variances (variable feedback from teachers before intervention - sum)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Levene Statistic</th>
<th>df1</th>
<th>df2</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.9 Lesson planning</td>
<td>0.602</td>
<td>1</td>
<td>50</td>
<td>.442</td>
</tr>
<tr>
<td>2.10 Language</td>
<td>0.225</td>
<td>1</td>
<td>50</td>
<td>.637</td>
</tr>
<tr>
<td>2.11 Materials</td>
<td>6.387</td>
<td>1</td>
<td>50</td>
<td>.015</td>
</tr>
<tr>
<td>2.12 Assessment</td>
<td>0.108</td>
<td>1</td>
<td>50</td>
<td>.744</td>
</tr>
</tbody>
</table>

a. time = B

### Table 6: T-test for independent variables (codes vs groups) after the intervention

<table>
<thead>
<tr>
<th>Variable</th>
<th>T-tests; Grouping: group (sp_vazba2.sta)</th>
<th>Group 1: E</th>
<th>Group 2: C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean E</td>
<td>Mean C</td>
<td>t-value</td>
</tr>
<tr>
<td>B1.1 Performance</td>
<td>0.826</td>
<td>1.000</td>
<td>-0.763</td>
</tr>
<tr>
<td>B1.2 Behaviour</td>
<td>1.478</td>
<td>1.517</td>
<td>-0.190</td>
</tr>
<tr>
<td>B1.3 Ability to cooperate</td>
<td>0.696</td>
<td>0.759</td>
<td>-0.339</td>
</tr>
<tr>
<td>B1.4 Use of mother tongue</td>
<td>0.522</td>
<td>0.655</td>
<td>-0.790</td>
</tr>
<tr>
<td>B1.5 Problems with grammar</td>
<td>0.609</td>
<td>0.828</td>
<td>-1.141</td>
</tr>
<tr>
<td>B1</td>
<td>4.130</td>
<td>4.759</td>
<td>-1.478</td>
</tr>
<tr>
<td>B2.1 Lesson structure</td>
<td>0.087</td>
<td>0.069</td>
<td>0.237</td>
</tr>
<tr>
<td>B2.2 Activities</td>
<td>0.304</td>
<td>0.241</td>
<td>0.500</td>
</tr>
<tr>
<td>B2.3 Time management</td>
<td>0.522</td>
<td>0.448</td>
<td>0.518</td>
</tr>
<tr>
<td>B2.4 Interaction patterns</td>
<td>0.304</td>
<td>0.138</td>
<td>1.461</td>
</tr>
<tr>
<td>B2.5 Teaching strategies</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>B2.6 Giving instructions</td>
<td>0.304</td>
<td>0.069</td>
<td>2.298</td>
</tr>
<tr>
<td>B2.7 Checking understanding</td>
<td>0.304</td>
<td>0.103</td>
<td>1.850</td>
</tr>
<tr>
<td>B2.8 Giving feedback</td>
<td>0.043</td>
<td>0.241</td>
<td>-2.002</td>
</tr>
<tr>
<td>B2.9 Lesson planning</td>
<td>0.043</td>
<td>0.069</td>
<td>0.384</td>
</tr>
<tr>
<td>B2.10 Language</td>
<td>0.087</td>
<td>0.069</td>
<td>0.237</td>
</tr>
<tr>
<td>B2.11 Materials</td>
<td>0.087</td>
<td>0.207</td>
<td>-1.184</td>
</tr>
<tr>
<td>B2.12 Assessment</td>
<td>0.043</td>
<td>0.034</td>
<td>0.164</td>
</tr>
<tr>
<td>B2</td>
<td>2.130</td>
<td>1.690</td>
<td>1.366</td>
</tr>
<tr>
<td>B NUMBER OF WORDS</td>
<td>335.870</td>
<td>327.483</td>
<td>0.461</td>
</tr>
<tr>
<td>A1.1 Performance</td>
<td>0.913</td>
<td>1.034</td>
<td>-0.482</td>
</tr>
<tr>
<td>A1.2 Behaviour</td>
<td>0.957</td>
<td>0.862</td>
<td>0.408</td>
</tr>
<tr>
<td>A1.3 Ability to cooperate</td>
<td>0.217</td>
<td>0.276</td>
<td>-0.433</td>
</tr>
<tr>
<td>A1.4 Use of mother tongue</td>
<td>0.478</td>
<td>0.552</td>
<td>-0.407</td>
</tr>
<tr>
<td>A1.5 Problems with grammar</td>
<td>0.565</td>
<td>0.552</td>
<td>0.079</td>
</tr>
<tr>
<td>A1</td>
<td>3.130</td>
<td>3.276</td>
<td>-0.328</td>
</tr>
</tbody>
</table>
The number of occurrences in different categories was compared in both experimental and control group. Before intervention there was no statistically significant difference between the groups (except for one variable, namely A2.6 Giving instructions). A significant change between the groups was measured in A2 category (total number of A2 subcategories) according to the number of occurrences in the second self-evaluation reports, concerning subcategories – it was recorded in 4 subcategories, namely A2.4 Interaction patterns, A2.5 Teaching strategies, A2.6 Giving instructions and A2.9 Lesson planning.

From the data it can be seen that in the first reports student teachers in the control group focussed mainly on students’ behaviour (average 1.53 in the control group and 1.48 in the experimental group) and their performance (see Table 2). The values in all subcategories of category 1 (except for performance) decreased in the second evaluation reports and all subcategories in category 2 either increased or remained unchanged. The biggest increase in the control group was recorded in subcategory 2.6 Giving instructions (0.3 to 1.0). Concerning teaching performance, student teachers focused their attention mostly on time management in the first reports and giving instructions and activities in the second reports. Generally speaking, there was a substantial shift from thinking and writing about students’ performance in the first reports to writing about teachers in the second reports. Student teachers started to reflect upon their own experience rather than evaluate students’ performance. To be more specific, the data are presented in the following table (Table 3) summarizing the notes dealing with students and teacher in both groups in the first and second records.

**Table 7:** Average numbers of references and average number of words reached before and after the intervention in both groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Time</th>
<th>1 Feedback about teachers average number of references</th>
<th>2 Feedback about students average number of references</th>
<th>average number of words</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVG E</td>
<td>E</td>
<td>B (first reports)</td>
<td>4.130</td>
<td>2.130</td>
</tr>
<tr>
<td>AVG E</td>
<td>E</td>
<td>A (second reports)</td>
<td>3.130</td>
<td>6.174</td>
</tr>
<tr>
<td>Difference</td>
<td></td>
<td></td>
<td>-1.000</td>
<td>4.043</td>
</tr>
<tr>
<td>AVG C</td>
<td>C</td>
<td>B (first reports)</td>
<td>4.810</td>
<td>1.720</td>
</tr>
<tr>
<td>AVG C</td>
<td>C</td>
<td>A (second reports)</td>
<td>3.318</td>
<td>3.540</td>
</tr>
<tr>
<td>Difference</td>
<td></td>
<td></td>
<td>-1.492</td>
<td>1.820</td>
</tr>
</tbody>
</table>
It can be seen from Table 7 that the focus on students and their behaviour was less intensive in the second report and the focus on the teacher was intensified; in the experimental group it almost tripled and in the control group it doubled compared to the first reports.

Content analysis was used to evaluate the quality of their feedback. The majority of student teachers improved their self-evaluation. Quotations from participants’ feedback were extracted to illustrate the extent of reflection. Student teachers concentrated their attention in the feedback before the intervention on the learners rather than on the teacher in both groups: “…their English skills had very good potential to master C1 level at the end of their study…”, “They didn’t want to cooperate with me”, “a boring lesson, they did not like the textbook and the students seemed to [be] sleeping…” While these comments would be acceptable as observation remarks, they say nothing about the teaching performance, their strengths and weaknesses and possible suggestions how to change it. Their critical reactions concentrated mostly on time management and planning. They stated, e.g.: “…only a few times [did] I manage to do everything I planned exactly according to my lesson plan. I often had to slightly modify the plan or change the order of the activities according to students…”; “bad time management – a lot of time spent on the activity…”.

After intervention in the experimental group we observed an increased number of themes that can be illustrated using the following quotes: “I did not correct all the mistakes students made…”, “small variety of activities…”, “…I didn’t motivate students at all…”, “work with ADHD… I reconsidered the number of activities…. Moreover, what could be observed was the balance student teachers tried to reach. They mentioned both positive and negative aspects about their own teaching considering strengths and weaknesses which was not the case of the control group. “I achieved better fluency and the dynamics of my lessons was according the students very good even though I still cannot manage my time in a way I would like to”.

The focus group interview was conducted with the experimental group after the end of the intervention procedure with the aim of learning more about the attitude of the student teachers towards regular evaluation of peers’ performance, giving and accepting feedback in VLE. All student teachers confirmed they could see the benefits of giving feedback to their peers. They became aware of the fact that a focussed and attentive observation of a peer had an influence on their own teaching performance, e.g. “…I realised that talking to the board is not effective and only watching Peter I realised I do it in the same way…” Student teachers also mentioned that they realised how important the feedback was when they were reading their peers’ evaluation of their own teaching. “…Even though it was very nice to read the positive feedback, I was looking for certain criticism, to learn what could be done in another way, to learn more what I should do to improve my teaching”. Not all student teachers were ready to be honest: “I did not want to be critical. I know that some of my mates did not manage to teach a good lesson but I did not want to tell them I didn’t like it… And may be… hmmm… somebody would like it”. Generally, all student teachers appreciated using VLE and explained they had more time to think about the lesson, watch certain parts more times if necessary and carefully consider how to comment on their peers’ performance. They also mentioned the benefit of peer evaluation in VLE which could be reread in comparison to the feedback conducted orally in a face-to-face situation in the classroom.

3.3 Discussion

Darling Hammond (2006, p.304) highlights that teachers (similar to student teachers) should demonstrate content knowledge, pedagogical knowledge and teaching ability. She stresses that the teacher must “learn to address the problems of practice they encounter and to meet unpredictable learning needs of their students – and they learn not only to their own practice but also that of their colleagues”.

The goal of this research was to explore whether student teachers would produce more thorough and detailed self-reflection as a result of e-learning online discussions/fora engagement. We assessed whether observing colleagues and providing them with VLE feedback would lead to deeper consideration of planning their own lessons. A further aim was to study the attitude of the student teachers towards regular evaluation of peers’ performance, giving feedback, accepting feedback and the possible benefits of the processes.

We observed the positive and statistically significant difference between the in-class and online groups as to the length of self-evaluation and the positive shift was recorded from the description of learners, their behaviour and activities towards reflecting the student teachers themselves. These findings are consistent with those of Ross and Starling (2008, p.183) who investigated the effects of self-evaluation training on
achievement and self-efficacy in a computer-supported learning environment. They concluded that self-evaluation training had a positive effect on student achievement, “the treatment effect was as large for females as for males and for those with low initial self-efficacy as it was for those with higher scores. However, self-efficacy increased more in the control than in the treatment group”. The results are also similar to those reported by Plesec Gašparić and Pečar (2016) who observed benefits of combination of online and face-to-face teaching for in-depth learning. Wilson and Friedrich (2015) noticed that participants started to use the same terminology and phrases from the tutors’ feedbacks in their reflections which was also the case in our study.

The results of the present study are in accord with the research conducted by Hsu and Huang (2015, p.161) who studied peer evaluation as a way or tool of promoting self-regulated learning and 84% of students in their sample agreed that “doing peer assessment on other students’ assignments led them to reflect on how they personally performed their own assignment”. Ertmer, et al. (2007, p.416) studied “students’ perceptions of the value of giving and receiving peer feedback, specifically related to the quality of discussion postings in an online course.” The results of their study indicated that even though they did not record “quantitative improvement in the quality of students’ postings during the peer feedback process, interview data suggested that participants valued the peer feedback process and benefited from having to give and receive peer feedback” (p.425). The results of our study indicate that the growth could be seen in both cognitive and social development of students. Peer evaluation led student teachers to critically look at peers’ work but also to perceive critical comments on their own work and they had to develop the mastery of giving critical feedback; as Breuch (2004, p.133) argued “peer review response may not be all that helpful when peers do not offer criticism or when they do not know what feedback to offer”. It is important to realise that peer feedback must be supportive, critical and at the same time constructive, with explicit arguments providing the suggestions, ways of improvement. Sometimes it is more difficult to learn to give feedback than to accept and receive feedback. Cheng and Warren (2005) showed that students in their research did not feel comfortable in peer-evaluation situations (they claimed they felt unqualified to provide the relevant feedback) and they did not rely on their peers’ evaluations. Stepanyan, et al. (2009) indicated that technology, especially those tools allowing for a certain degree of anonymity, can create a safe environment that encourages student participation. Contrary to expectations, student teachers in the present study stated they had no problem with giving feedback but they had to learn how to present the ideas in a way that was beneficial to their peers. Our findings are consistent with that of Grez, et al. (2012) who reported students’ very positive attitude towards the value of peer evaluation.

Concerning using VLE, student teachers positively responded to the possibility of asynchronous communication, they appreciated the permanence of the online feedback compared to the immediate face-to-face feedback in class. This, however, stands in contrast with the results of a study conducted by Kemp and Grieve (2014) who compared undergraduates’ preference for online vs. tradition face-to-face classrooms, and their academic performance. Students strongly preferred running discussions face to face but there was no significant difference in their test performance. This is an important finding as the learners’ preference, meeting learner’s needs and preferences is reflected in their motivation and result. The reasons they introduced were immediate feedback, stronger and more active engagements than in online discussions. As to the written activities, participants preferred the online mode.

Facilitating active engagement was not the subject of the present study, however, it seems to be an important factor that might influence the success of blended or online learning and thus should be the subject of further research.

4. Limitations

Generally, in accordance with Cohen, Manion and Morrison (2011, p.179) it needs to be acknowledged that qualitative data such as those presented in this study do carry a certain degree of bias as to “the subjectivity of respondents, their opinions, attitudes and perspectives”. In this way several limitations are apparent within the presented study. It was evident that results would be influenced by specific characteristics and culture of this group and might fail to bring generalizations applicable to any other group. The risk of bias is high and we have no way to determine how closely the sample value is likely to approach the population value.

In addition to some of the limitations mentioned another potential problem is that the sample size was modest and split into control and experimental groups based on their discretion.
The natural limitation with direct observation is the change in student teachers’ performance when they know they are being observed and also the fact that observers may have misunderstood what has been observed (incorrect analyses). To make the analysis more valid and reliable multiple researchers were involved.

5. Conclusion

Reflection in pre-service teacher training seems to take a high level of importance and does not always find a proper place within classroom limitations (e.g. Brandt 2008; Copland, Ma and Mann 2009). Taking into considerations what student teachers need to go through in their reflective teaching, e.g. examine their beliefs about the teaching or learning process and search for the reasons for their decisions, reflection requires attention, private consideration in a supported and safe environment.

This study presented the results of the intervention in a teacher training programme which was focused on inclusion of e-learning components into regular face-to-face teaching with the aim of deepening the experience of giving and getting feedback and reflecting on one’s own teaching. Our main argument is that the face-to-face learning experience does not provide sufficient conditions for deep involvement in reflecting upon one’s own performance and does not allow sufficiently for peer reflection.

The results of the study suggest that student teachers when given sufficient time and space learnt how to accept peer feedback more easily and to evaluate themselves more profoundly. Student teachers stated they could see the benefits of collaboration in VLE in their own ability to evaluate and reflect on their own performance and behaviour. A positive shift in the quality of self-evaluation was also observed in the transfer from the focus on learners and from the descriptive way of the reports before intervention to more complex self-evaluation after the intervention programme. Online discussions did generate more thorough and detailed self-reflections thus its incorporation in face-to-face learning can positively contribute to the quality of pre-service teacher preparation.

Despite the limitations stated above, it can be concluded that this experience of introducing an e-learning supplement to a face-to-face course provided the opportunity to focus the reflection and critical thinking of student teachers not only on the behavioural domain but also on cognitive and emotional domains. Student teachers also had more space to consider and think profoundly about their values, motivations and understand where their strengths and weakness were. Future research focus needs to address facilitating student engagement as well as the tools for supportive and effective collaboration in VLE.

Acknowledgement

This article is a partial outcome of the research project KEGA 065PU-4/2016.

References


A Conceptual Understanding of how Educational Technology Coaches help Teachers Integrate iPad Affordances into their Teaching

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Abstract: Educational technology (ed tech) coaches can help teachers and students integrate iPad affordances into their teaching and learning. A brief overview of affordance theory is provided. While investigating the under-researched practices of ed tech coaches, the authors identified iPad affordances and tabulated these, revealing links between the iPad’s technological capabilities, technological affordances and pedagogical affordances. Nine iPad technological capabilities, such as the camera, were aligned with some of their technological affordances, such as taking a photo. These were matched to some pedagogical affordances, such as taking a photo for educational purposes. Finally, different categories in the table were combined into six broad strands unveiling how ed tech coaches use them to change teacher pedagogy with benefits for teachers, students and parents. Ed tech coaches often naturally build teachers’ TPACK, mostly through the SAMR model. Specifically, they change teachers’ pedagogy by focusing on polysynchronous teaching and learning; digital, transformed learning; student ownership of learning with teachers as facilitators; students as teachers of content and technology; teachers’ triple agendas of content elaboration, academic argument, and digital citizenship; and student creativity.

Keywords: iPads, affordances, ed tech coaches, TPACK, SAMR.

This paper draws conclusions from a descriptive analysis of a literature review on the affordances of iPads. It is rooted in research considering the role of educational technology (ed tech) coaches in helping teachers to use these affordances and the resultant pedagogical changes, as this was not researched previously. The research, underpinned by grounded theory, garnered data about ed tech coach practices and resultant teacher pedagogical changes. These were drawn from voice recordings of interviews with and observations of five ed tech coach and five teachers they supported. After transcription and analysis by the researcher, the findings were developed into a proposed model of an ed tech coach. The research was informed by Mishra, Koehler and Cain’s (2013) Technological Pedagogical Content Knowledge Framework (TPACK) and PuenteDura’s (2014) Substitution Augmentation Modification Redefinition (SAMR) model. TPACK contextualized the researcher’s understanding of what the coaches wanted to achieve, while the SAMR model gave insight into how they helped teachers change their pedagogy.

As will become apparent, the literature on educational tablet use concentrated on affordances and applications (apps) available for teaching. iPad research has shown that the access-to-resources barrier may have been reduced and technological integration eased (Jodoin, 2013). Less has been written about how teachers’ pedagogy might have changed. While Valstad and Rydland (2010) decried leaving iPad integration to individual teachers, Nguyen, Barton and Nguyen (2014) communicated the concomitant need for suggestions to adapt pedagogy. Reid and Ostaszewski (2011) revealed an early pedagogical change when record-and-play video functionality demonstrated Ukrainian dance movements with students controlling devices.

We review affordance literature and then postulate conceptual links between the iPad’s technological capabilities that create technological affordances leading to pedagogical affordances. Technological capabilities can be defined as the hardware and software elements of the physical iPad and its applications. An example of both elements would be the physical camera and its operating software. Technological affordances can be defined as the use of technological capabilities, for example, using the camera to take a photo. Pedagogical affordances can be defined as the use of technological affordances for pedagogical purposes, such as using a photo to elucidate an educational concept. We articulate specific examples of these concepts, clarifying their relationships. We discuss the pedagogical affordances as six broad strands illustrating how teachers’ pedagogy can change, when filtered through the TPACK and SAMR models, giving specific benefits
for teachers, students and parents. This conceptual understanding of iPad classroom usage rebuts Murray and OůĐĞƐĞ͛Ɛ (2011) assertion that such technological usage supports behaviourist or early cognitive positions.

The paper is structured as follows. Affordance theory briefly provides context, then pre-tablet Information and Communication Technologies’ (ICTs’) educational affordances are discussed. Thereafter tablet affordances are explained, followed by a table linking nine iPad technological capabilities to their technological affordances, and some of their pedagogical affordances. Subsequently, a theoretical conception of six ways in which iPad technological affordances can create new pedagogical affordances, and change pedagogy, is provided. The conclusion is advanced that teachers can change their pedagogy through using these relationships to develop their TPACK, especially through the SAMR model, with six advantages for teachers, students, and parents.

1. A Brief Overview of the Foundations of Affordance Theory

Gaver’s (1991) work, on the importance of affordance signalling in design, accentuated the alignment of intended and actual use to make tools easy to use. Norman (1999) characterised affordances as embodying possible interconnections between actors and objects, focusing on the actor’s intentions and tool design as driving affordance perceptions (McGrenere & Ho, 2000). However, Hammond (2010) asserted we see affordances through interactions with objects, while Gibson (2014) held our affordance perception revealed our self-perception; both authors concentrated on actors and actions. Greeno (1994) and McGrenere and Ho (2000) articulated this as the confluence of the indissoluble actor-environment relationship. They agree with Gaver (1991) that affordances are actor-independent, but usability depends on an actor’s knowledge, experience, and culture. We include social identity and purpose, as Rietveld and Kiverstein (2014) argue affordances are embedded in socio-cultural practices, dependent on specific contexts and skill levels. Orlikowski (2007) refers to this user-affordance nexus as constitutive entanglement.

With computers, Norman (1999) distinguishes between physical affordances, such as the keyboard, and perceived affordances represented by graphic conventions, such as the cursor. Oliver (2005) extends Norman’s point about actors’ understanding such conventions, to include learning different ways symbols are signalled. Kennewell (2001) advances Greeno’s (1994) and Hammond’s (2010) postulation of constraints as being the obverse of affordances, asserting that affordances provide action through constraints that provide structure. Nevertheless, Kennewell (2001) observed ICTs having peculiar classroom affordances, being dependent on other classroom variables.

2. Affordances of Pre-tablet ICTs in Education

Conole and Dyke’s (2004) pre-tablet work drew on early iterations of online tools. They attended to affordance expression, their compilation in an ITC taxonomy, and educational applications, listing ten beneficial areas for teachers’ pedagogy, and organizational changes necessary to accommodate these. We argue that three (speed of change, monopolisation, and surveillance) fall into the domain of organisational change, while the rest (accessibility; diversity; communication and collaboration; reflection; multimodality and non-linearity; risk, fragility and uncertainty; and immediacy) lie more under teachers’ control. These necessary but insufficient issues disregard teachers’ pedagogical change.

Before tablets and dependent on school resources, teachers and students could use desktop and laptop computers in computer laboratories, mobile phones, games consoles, MP3 players, digital cameras, interactive whiteboards and iPod Touches (Department of Education and Early Childhood Development, 2008). In weekly lessons, students learnt word processing skills (see Department for Education and Skills, Abbott, Webb, Blakeley, Beauchamp, & Rhodes, 2003), or did mathematics drills. Department for Education and Skills (2003) and Sampson et al. (2013) bemoaned computer-connected interactive whiteboards being teacher controlled, used solely as electronic chalkboards. Agostini and Di Biase (2012) noted using interactive devices in primary classrooms resulted in deeper communication and involvement. Similarly, Caldwell (2007) observed increased engagement and feedback when clickers (classroom response systems) polled students anonymously.

Before tablets, iPod Touches afforded the greatest teacher and student interactivity, allowing for easier presentation of audio and visual material (Reid and Ostashewski, 2011). In 2009, Hayward School, now Essa Academy, in Bolton, England, gave each student an iPod Touch (Innovate my School, 2012). From the first year, it was considered a major trigger in turning the school’s failing results around as the Wi-Fi-enabled devices allowed direct access to teacher-created podcasts, educational and gaming apps and the Internet. Innovate my
School (2012) detailed they were used to make notes, email work, complete administrative tasks and exam revision. Furthermore, Innovate my School (2012) divulged with their large refugee population and dozens of mother tongues, the dictionary and thesaurus apps improved students’ English without their leaving class to attend language lessons and they read Wikipedia in their home language to understand topic basics. Subject-specific apps, such as *Shakespearean Insults* [original emphasis] and *Elements* [original emphasis] enabled teachers to present English and chemistry material in engaging ways. Moreover, Innovate my School (2012) disclosed the devices helped technophobic teachers and boosted student self-worth. This could lead to students influencing teachers, even changing their pedagogy and is discussed later. Compared to other devices, the iPod Touch allowed for the greatest interactivity and flexibility between teachers and students, foreshadowing the introduction of tablets.

3. Tablet Affordances in Education

The early literature did not deeply examine general tablet affordances, as most dealt with iPads only. Nguyen, Barton, and Nguyen (2015) describe this early, extensive iPad adoption by younger students and academics. In considering post-PC tablets, Godsk (2013) focused on iPads, Android tablets, Blackberry Playbooks and HP Touchpads. Without differentiating between them, he listed, with supporting studies, the top 10 affordances as: engaging, inclusive and or collaborative learning; mobility or flexibility in place; use of multimedia or interactive content and apps in teaching; student satisfaction; personalisation and student-centred learning; use of e-books; resource saving; flexibility in time and place; eco-friendliness; and resource competitiveness. We consider the first five the more important as they directly impact teachers and students.

However, when teachers and students, used to non-Apple operating systems, change their paradigm and engage with iPads, they appreciate its intuitive design, high levels of usability, and the glitch-free switching between applications (Golland, 2011). One major affordance, video capability, can increase social capital (Quidwai and Norman, 2016). They tasked trainee physician assistants with creating videos rather than writing a paper, about the community surrounding Keck Medical School and their potential future professional engagement with such. This dramatically improved student empathy. They were sensitised to challenges facing those dependent on state-provided health care and to their interactions with people from varying backgrounds. The fuller implications of affordances on teachers’ pedagogy are discussed later.

Haßler, Major, and Hennessy (2016) considered all tablet brands in reviewing evidence on students’ learning outcomes. They found support for teachers positively changing group discussions and learning outcomes through using tablets in many-to-one situations. Teachers’ transformed pedagogy resulted in improved end products when compared to the interaction and group communication of one-to-one situations. Herodotou (2017) examined how young children used non-iPad tablets without mentioning specific device affordances. Lazarus, Sookrajh and Satyapal (2017) examined second year South African medical students’ engagement with non-iPad tablets and their associated affordances and challenges. Semmelmann, et al. (2017) mentioned mobility, cost and implementation of tablet affordances as facilitating developmental psychological research with young children, some of which might apply to educational settings. Traxler (2010) warned about quality assurance difficulties educational providers, especially universities, could face. He cited a pilot study showing students were unlikely to use devices provided for them by institutions if these were not aligned with devices students wanted to use. In a school, however, tablet standardization might prevent stakeholders having to cope with several operating systems as could happen under a Bring Your Own Device policy.

4. iPad Affordances in Education

National Association of Advisors for Computers in Education (NAACE) (2012) noted the dominance and educational value of the iPad, when compared to Android devices, because of the reliable operating system, interface and the numerous educational apps. Reed (2013) considered the iPad’s reliability as giving it frontrunner significance in technological innovation and ubiquity. Compared to other tablets, Meyer (2013) affirmed iPads’ lower maintenance costs. Clarke and Abbott (2016) reiterated Copeland’s observation that iPad ICT skills could be learnt without formal teaching. This impacts pedagogy as it relieves teachers of a significant technical burden, ensuring teaching and learning continue uninterrupted.

Lane (2012) oriented iPads as unitary devices with an array of modalities suitable for researchers, teachers, students and others. Valstad and Rydland (2010) align this with the modality principle that multimedia, not visual, presentation results in better learning. Karsenti and Fievez’s (2013) comprehensive survey enumerated...
16 main benefits for students using iPads, including more diverse pedagogy. Clarke and Abbott (2016) endorsed the benefits of iPad apps reinforcing traditional pedagogy. Cochrane, Narayan, and Oldfield (2011) furnish details of links between iPad capabilities, social constructivist pedagogy, and the application of affordances for diverse tertiary students.

5. What are the Links Between the Technological Capabilities, Technological Affordances, and Pedagogical Affordances of the iPad?

It is useful to see the technological capabilities of the iPad as the built-in design elements, such as size, touch screen, battery life, and camera; as well as installed software apps such as email, web browser, calendar, and the note, slide and video-making programmes. (Apple Inc., 2018) Technological capabilities become technological affordances when they are used; for example, using the camera to take photos or videos. The pedagogical affordances refer to the way teachers and students use the technological affordances to meet educational goals. The camera (technological capability) might be used to take a photo (technological affordance) of a flower to record its beauty. It might be used (technological capability) to take a photo (technological affordance) of a flower to show leaf arrangement (pedagogical affordance). The purpose to which the technological affordance is put determines its categorisation as a pedagogical affordance. We turn to a tabulated description giving specific examples of these concepts to clarify some of their relationships.

Table 1 matches some of the iPad’s capabilities to some of its technological and pedagogical affordances. The authors divided the affordances of iPads into three underlying physical, software and connectivity capabilities (first column in the table). These give rise to technological affordances (second column). Finally, some of the resultant pedagogical affordances are listed (third column). We cannot match all iPad capabilities with all their technological affordances and pedagogical affordances, as coaches, teachers and students are endlessly creative, so no exhaustive listing of them would be possible. We categorise some of the obvious ones and the relationships between them. The discussion mentions some linkages with the TPACK and SAMR models.

Table 1: Matching Some Specific iPad Capabilities to Some of their Technological Affordances and Pedagogical Affordances.

<table>
<thead>
<tr>
<th>IPAD CAPABILITY</th>
<th>TECHNOLOGICAL AFFORDANCE</th>
<th>PEDAGOGICAL AFFORDANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Size (physical capability)</td>
<td>Portability</td>
<td>Learning is ubiquitous, flexible, polysynchronous (not time bound)</td>
</tr>
<tr>
<td>2) Long battery life (physical capability)</td>
<td>No power cable needed</td>
<td>Teacher and student mobility, inside and outside of classrooms</td>
</tr>
<tr>
<td>3) Touch screen (software capability)</td>
<td>Direct interface</td>
<td>No mouse, no external keyboard, no track pad</td>
</tr>
<tr>
<td>4) Intuitive interface</td>
<td>Quick and easy to learn</td>
<td>Tap and swipe</td>
</tr>
<tr>
<td>5) Integrated audio and video (software capability)</td>
<td>Take and play back audio and video recordings</td>
<td>Movie or audio recordings</td>
</tr>
<tr>
<td></td>
<td>Access to worldwide resources</td>
<td>Authentic learning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Virtual stage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sophisticated presentations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Written or spoken comments</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Teacher carries little home</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flipped classroom (content covered outside school, understanding checked at school, reversing traditional classwork and homework)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Special needs learners</td>
</tr>
<tr>
<td>6) Guided access (software capability)</td>
<td>Temporarily restrict to single app</td>
<td>Stay on task</td>
</tr>
<tr>
<td></td>
<td>Choose which app features are available</td>
<td>Disable task irrelevant screen areas</td>
</tr>
<tr>
<td></td>
<td>Disable hardware buttons</td>
<td>Prevent accidental gesture distractions</td>
</tr>
<tr>
<td>7) Apps (software capability)</td>
<td>Seamless integration</td>
<td>Document and resource sharing eases collaborative work</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Learner material construction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Heutagogy</td>
</tr>
<tr>
<td>8) Apple TV(^1) (connectivity capability)</td>
<td>Share one iPad screen to whole class</td>
<td>Whole class sees peers’ or teacher’s work</td>
</tr>
<tr>
<td>9) Apple Classroom(^1) (connectivity capability)</td>
<td>Monitor and manage iPads</td>
<td>Only teacher sees each student’s work</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Teacher sends/receives work through any app to/from individuals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Teacher corrections</td>
</tr>
</tbody>
</table>
Apple TV and Apple Classroom recall one teacher giving differentiated learning to a class at one time through a teaching machine (Spark & Sackstein, 2014) but does not support a behaviourist perspective, as using either reformulates the teaching machine idea.

The table is more fully explained as six strands in which teachers’ pedagogy can change, sometimes when filtered through TPACK and SAMR models. Each strand gives detailed examples from the point of view of different school stakeholders; teachers, students and parents.

6. A Theoretical Conception of Six Ways in Which the iPad’s Technological Affordances can Create New Pedagogical Affordances and Change Teachers’ Pedagogy

The unique strengths of the iPad are the stable operating system, intuitive interface, seamless app integration, and continuous support provided by Apple through teacher-led workshops. Although the latter is not discussed here, the rest can change pedagogy, as raised by State of New South Wales (2012), and strengthen TPACK (Koehler, Mishra and Cain, 2013). Changed pedagogy can lead to students’ developing Trilling and Fadel’s (2009) 21st century skills of thinking, problem-solving, communication, collaboration, creativity, and innovation, rather than leading to passive consumption of texts, videos, and games (see The Learning Exchange, 2011).

Students are unlikely to achieve these skills unless teachers deliberately integrate them into their teaching (see Attard, 2013; Geer, White, Zeegers, Au, and Barnes, 2015; Krauskopf, Zahn, and Hesse, 2012; Lange and Meaney, 2013; McFarlane, 2013; and Spark and Sackstein, 2015). Rockman declared pedagogy trumps anything (Cuban, 1993, see also Joy and Garcia, 2000; Seau Yoon, Ho and Hedberg, 2004). Sackstein (2014) contrasted the contexts of product and idea technology. Warringa Park School (2013) concurred that iPads support, not replace, good teaching.

Technology does not teach, teachers do. How can teachers change their pedagogy and use iPads in their teaching? They must adapt and learn continually themselves (Darling-Hammond, 2006). They must lead the change and model iPad use (Bansavich, 2010, and Nguyen, Barton and Nguyen, 2014). Staff training and collaboration time with digital mentors, such as ed tech coaches, is crucial Cowan and Earls (2016).

How can ed tech coaches help teachers change their pedagogy? We present six ways coaches can use the iPad’s technological capabilities and technological affordances to create new pedagogical affordances teachers can implement, often using SAMR to develop TPACK. Now, the nine technological capabilities listed in Table 1, their associated technological affordances and their most pertinent pedagogical affordances, are amplified.

6.1 Polysynchronous Teaching and Learning

Here we turn to the affordances of the iPad’s size, battery, screen, interface, audio/visual and apps. Polysynchronous teaching and learning is not necessarily bound by time and space. It can happen synchronously or asynchronously in the classroom or online (see New Media Consortium, 2016). Firstly, pedagogy changes when the iPad is used as an all-in-one device, meeting SAMR’s Redefinition requirements. Students complete all aspects of different tasks using the iPad only (see Warringa Park School, 2013). Secondly, students receive tasks electronically, find online resources, complete the task through an appropriate app, submit completed digital work, and receive written or verbal comments digitally. Class-facing boards, printing or photocopying machines, even stationery becomes irrelevant. Through condensing teaching functions in time and space, the iPad simplifies and extends teacher and student capability, fulfilling Cuban’s (1993) promise of productivity, and meeting Murray and Olcese’s (2011) technological significance criterion that users become more productive. Polysynchronicity could ensure uninterrupted teaching and learning. Teachers and students need not inhabit the same physical classroom at the same time. Moving away from industrial era school models (State of New South Wales, 2012), extends times and spaces where learning occurs (Warringa Park School, 2013), effecting Brand and Kinash’s (2010) prescience of anywhere and anytime education. NAACE (2012) claims easier access to resources through reduced effort, time and travel costs, with concomitant efficacy. Souleles, et al. (2015) assert proactive art and design students working in digital media benefit when time and space constraints are removed.

Polysynchronicity advances two pedagogical changes. Firstly, teachers assimilate their TPACK when giving students texts, quizzes, or videos, that introduce new material, to work through at home, then check student understanding and resolve misconceptions during class. Reichert (2016) construes this remediation as in-class
differentiation. Cuban (1993) foreshadowed this as students receiving personal instruction without the teacher being present. This flipped classroom pedagogy enables students to view the material as often as they need, privately, without publically indicating their lack of full understanding the first time, and it enables students to review material as needed before assessment. The New Media Consortium (2016) revealed significant student gains with this blended method. Student metacognition increases with awareness of differences in thinking between first and last viewings as Kolb’s experiential learning theory applies (Healey & Jenkins, 2000).

Secondly, remote contact and productive work remains possible when staff or students are absent or apart. Students submit completed work and teachers their marking when they are finished, not when they next see each other. Students develop independence when iPads are used thus (Reid and Ostashewski, 2011). With Innovate my School (2012) and Sampson et al. (2013) they reflect on the reciprocity digital contact gives students and teachers, through increased communication, support and enhanced relationships (see also Faris and Selber, 2013; Khoo, et al.,2013). Time and place do not limit teachers or students as ubiquitous, mobile, flexible, and polysynchronous learning becomes a reality.

Polysynchronicity can relieve parent concerns about children missing teaching and learning. The iPad is the device through which work is given, done, submitted, assessed, and returned. Everything happens in one place, so students cannot leave things at home or school. Work is submitted directly to the teacher or returned to the student digitally, so it is not lost, misplaced, or unreturned. Students can repeat view videos of their teacher teaching, where a familiar person teaches them in a familiar way. The potential downside of poor teaching is remedied through access to the work of others, such as Khan Academy, Harvard University, or anyone choosing to make videos available online.

6.2 Digitised, Enhanced Learning Compared to Digital, Transformed Learning

Now the affordances of the iPad’s screen, interface, audio/visual, apps, Apple TV and Apple Classroom are applicable. The iPad changes pedagogy if tasks fulfil the Modification and Redefinition criteria of the SAMR model (Puentedura, 2013). This model distinguishes between enhanced learning (Substitution and Augmentation tasks) and transformed learning (Modification and Redefinition tasks), also known respectively as digitised and digital learning. The difference lies in the degree of technological engagement. Ed tech coaches sometimes take teachers through the SAMR model steps to increase their confidence. This can be exemplified through a teacher setting an essay task.

6.2.1 Enhanced or digitised tasks

Enhanced or digitised tasks are Substitution tasks; they are paper-under-glass tasks such as writing an essay using a word processing app rather than handwriting it. Teachers’ TPK slightly increases as they must scan and upload tasks. This level of technological engagement does not increase conceptual engagement. Presentation, not thinking has improved. Thinking, not typing, is important. Augmentation allows wider functionality such as using different fonts. Teachers’ TPK is moderately increased as the iPad allows for word processing, but this is not transformative engagement. In contrast, transformative or digital tasks require students to engage with the iPad in significantly different ways that extend their capability, allowing them to do things otherwise impossible.

6.2.2 Transformative or digital tasks

For an essay to qualify as Modification students share essays digitally, perhaps through a class blog or wiki. This improves teachers’ TPK as they set up the platform and its parameters. It changes how students think about the essay, keeping in mind the larger peer audience, who may be more critical in online comments than the teacher. Sharing with wider audiences could develop authenticity as interested, expert adults might read the essay rather than the teacher only (Zielezinski, 2017). Learning from others globally expands nuanced understandings of cultural contexts beyond one’s own (Deinhammer, 2016). Teacher-digital sharing encourages active dialogue with colleague communities (Harris, Mishra and Koehler, 2009).

Finally, using the iPad to create, film, and edit a video based on the essay exemplifies Redefinition as teachers’ TPCK coalesce in task and rubric design. The pedagogical purpose of the essay is changed. Students think about their writing in more visual terms as the process is geared towards a visual product.

These examples show teachers and students engaging with technology in substantially different ways and greater student creativity is often displayed. Both extend their capability through modifying the process and
product of their thinking, with changed pedagogy redefining and transforming the task, so it could be completed only digitally on the iPad. Before iPads, these tasks were not possible using one device only.

The payoff for parents is having digital access to their child’s work, and to the shared work of the class. This is especially beneficial for reviewing a child’s progress before or during teacher-parent meetings, even if viewed remotely (Warringa Park School, 2013). Parents can see their children working in ways that are familiar to them from their own working lives.

7. Student Ownership of Learning with Teachers as Facilitators

Next, the affordances of the iPad’s battery, screen, interface, audio/visual, guided access, apps, Apple TV and Apple Classroom are pertinent. Pedagogy changes if students have opportunities to own their learning more directly than studying for tests and examinations allows (Churchill, Fox and King, 2012). Oakley, et al. (2012) mention co-operative reciprocity between teachers and students. Clarke and Abbott (2016) informed on differentiated teaching amongst the young or less able students. Similarly, Warringa Park School (2013) linked iPad control to learning control, in a special school setting, while they, and Reed (2013), linked student ownership of learning with higher creativity. This seems to occur when teachers change from show-and-tell pedagogy to facilitating learning by providing structures and formats for learners to find, integrate, apply, and present information by themselves, meeting SAMR’s Redefinition terms. Reichert (2016) formulates this in terms of students focusing on learning, rather than on teachers’ teaching. Comparably, Sackstein (2014) clearly expounds on performance and competence pedagogic modalities. Students working independently, in groups, or as a class epitomise competence pedagogies (Burden, et al., 2012). When teachers facilitate the context, students engage increasingly actively with material to construct meaning (Spark and Sackstein, 2014).

iPads and their apps can be used in the same way, at the same level, by teachers or students, increasing their versatility. When teachers and students have equal access to resources Cochrane et al., (2011) appreciated the resultant collaboration and materials development, with students especially being creative. (Maher, 2013) and Reichert (2016) accentuated app multifunctionality enabling integration at any level in any field, when compared to more limited and limiting task-specific apps. The New Media Consortium (2016) explain this vanguard development as evidence of student-centric experiences promoting deeper learning, leading to changes in tertiary education, with academics as guides in online and blended learning, enabling student ownership of lifelong learning.

Aspects of the TPACK and SAMR categories can be reflected in one task with students taking ownership of their learning when teachers facilitate. Teachers might progress sequentially through the SAMR model, as they develop their TPACK, but not necessarily so (Geer, et al., 2015). An earlier stage (substitution or augmentation) may be relevant even when teachers are more experienced in modifying and redefining their tasks. If a teacher wants each student to research one aspect of the causes of World War I, and present this, the following might transpire. Task requirements are written up in Pages (Substitution). This is emailed to students (Augmentation). Students insert text, images or videos into individual Book Creator books (Modification). Students combine their books into one digitally shared Book Creator book (Redefinition). The teacher has facilitated student ownership of their learning through supplying detailed task information and rubrics. Empowered students gather information and compile their presentations. Throughout, the teacher has used TPK (knowing the technological demands matched the pedagogy), TCK (developing the rubric) and PCK (deciding on the task), revealing TPACK integration.

Parents can become aware of children working in sophisticated, complex, and collaborative ways. Students are more willing to discuss schoolwork with parents (Burden, et al., 2012), increasing their role in their child’s education, and strengthening school-home relationships (Warringa Park School, 2013). Students mature as they take more responsibility for their learning, with possible positive impacts on entering tertiary education more able to study independently.

8. Students as Teachers of Content and Technology

Now we consider the affordances of the iPad’s size, screen, interface, audio/visual, guided access, apps, Apple TV and Apple Classroom. Digital sharing can change pedagogy, meeting SAMR’s Modification specifications, as it has wider implications than students sharing with peers, as teachers have always required them to do. Clarke and Abbott (2016) consider students as teachers of their teachers, while Attard and Curry (2012)
designated students as peer teachers. State of New South Wales (2012) postulated content creation apps allowed a deeper educational impact than task-specific apps. As mentioned previously, if the teacher-facilitated but student-created Book Creator book becomes the class textbook or study guide for the topic, then students have become the teachers of their peers. This might involve teaching about content directly, but also about technology indirectly. They might teach about the content and format of their presentation, as not all students will use technological affordances in the same pedagogic ways. Students seem to readily experiment with different ways of being creative. Similarly, Laurillard (2000) calls attention to the reality that student interpretation and app usage depends on context. If work is done at home, then students might also be responsible for teaching their friends, siblings, and even parents. Warringa Park School (2013) expanded on this.

9. Teachers’ Triple Agendas of Content Elaboration, Academic Argument, and Digital Citizenship

Here the spotlight is on the affordances of the iPad’s interface, audio/visual, guided access, apps and Apple Classroom. It seems that teachers follow two agendas, content elaboration and its academic realization. They discuss what proof or evidence reveals good thinking and acceptable argument academically through the content of their subject. iPads can change teachers’ pedagogy, allowing the addition of a third agenda, good digital citizenship, as the iPad enables teachers to develop and enrich their TPACK.

This changes pedagogy in two ways. Firstly, teachers must teach good digital citizenship, especially plagiarism and referencing, because of fingertip access to global online resources in different formats, as well as access speed (see Oakley, et al., 2012). Secondly, iPads remove the need to collect and store physical resources. Teachers can direct younger students to digital resources from an online, curated range, or older students to digital resources from the spectrum of opinion and thought within that subject. Instead of solely seeking inspiration through teacher presentations, student creativity can flourish when they are exposed to diversely formulated materials, meeting SAMR’s Modification and Redefinition conditions. With easy Internet access teachers are not knowledge gatekeepers. Their responsibility lies in applying digital citizenship in and through their subject, and by using sources ethically and appropriately themselves. Cut-and-paste plagiarism and superficial resource use hinders academic depth of argument. Teachers must set tasks needing academic argument construction and support. When students take digital citizenship seriously, their intellectual honesty raises the levels of awareness around integrity, scepticism, and personal accountability, benefitting parents and wider society.

10. Student Creativity

Lastly, we evaluate the affordances of the iPad’s size, battery, screen, interface, audio/visual, apps, Apple TV and Apple Classroom. Blackwell (2014) commented that easy and quick access to resources enabled greater levels of student creativity resulting in more sophisticated products, even in early childhood education classrooms. Karsenti and Fievez (2013) accentuated the improved quality and creativity of presentations, in line with SAMR’s Augmentation and Redefinition proposals.

Maher (2013) framed multimodal resources as allowing individual ways of achieving the same end. Students can use more media in more ways to create powerful pieces of work; pasting paper onto cardboard is no longer the sole creative outlet. Students can be given tasks requiring a higher level of creativity, even in some cases, complete flexibility as to how the work should be formatted and presented. A student making a poster with a printed picture of Hitler and text from one of his speeches, is not as powerful as searching for, selecting, and then inserting a video clip of the same speech into a Keynote presentation. If there is a time-length or a data-size limit to the task, students must decide about the relevance and appropriateness of different videos. Previously this was the teacher’s responsibility. In assessing how well an individual video meets the task criteria, students need to watch all the videos several times to justify their final selection, leading to greater familiarity with different aspects of the material, and a strengthened emotional connection to it. Students who read a textbook only have an intellectual understanding of Hitler’s oratory. It is another matter to select one video from many to understand his oratory more viscerally, after seeing the intensity of his facial expressions, observing the forcefulness of his body language, hearing the tone and tenor of his speaking and attending to audience responses.
Teachers would be well-rewarded, perhaps to their initial surprise, in giving students some opportunity to increase the academic depth of their work on their own, and to have greater control over its creativity and presentation. Burden et al., (2012) accentuated the exploratory and collaborative interactivity of students and teachers learning together. This partially solves the problem of teachers unable to envision collaborative tasks (Sackstein, 2014), as does Nguyen, Barton and Nguyen’s (2014) reminder that social apps can foster academics’ collaboration. Moreover, students can help their parents improve their own work presentations or use their creativity to explore different hobbies or careers.

11. Conclusion

This paper argued that the iPad’s technological capabilities create technological affordances that can lead to the development of new pedagogical affordances. Firstly, nine specific examples of the concepts were tabulated to clarify some relationships. Secondly, the pedagogical affordances were discussed through six broad strands illustrating how teachers’ pedagogy can change. Each discussion lists specific benefits for teachers, students, and parents.

The iPad’s technological affordances give six ways for teachers to transform their pedagogy. Firstly, polysynchronous teaching and learning allows for face-to-face, synchronous and asynchronous education; for teaching to occur in different places at the same time; for students to repeatedly review material at their convenience; for increased student metacognition; and for students to submit work upon completion. This ensures uninterrupted education, as one-time, face-to-face teaching is not the norm, and parents know that education is always accessible for their children. Secondly, digital, transformed learning alters the process and product for students, extending their creativity and capabilities and bringing them closer to adult working life. Thirdly, when teachers allow students to own their learning, this extra responsibility matures them, enabling independent, lifelong learning. Fourthly, empowered and confident students teach themselves, their peers, friends, and family members. Fifthly, teachers who teach digitally raise academic integrity in students. Sixthly, teachers develop creative and academically confident students when they research topics of their choosing, in formats of their choosing.

There are clear relationships between the iPad’s technological capabilities, its technological affordances, and the pedagogical affordances these allow. Ed tech coaches can use them to develop their teachers’ TPACK, especially when using the SAMR model. Moreover, there are six ways teachers can transform their pedagogy and benefit their students.

References


www.ejel.org 131 ISSN 1479-4403


Assessing Air Force Officers’ Satisfaction on the Use of SOC Virtual Classroom: Input to Professional Military Education e-Learning Design and Implementation

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Abstract: As the power of Learning Management System (LMS) in supporting classroom instruction has been observed in Higher Education Institutions (HEIs), only few has been documented in military environment using this kind of learning technology. This paper is the first attempt to investigate the satisfaction of air force officers on the use of Squadron Officer Course Virtual Classroom (SOCVC) in the Philippines. The popular Modular Object-Oriented Dynamic Learning Environment (MOODLE) was used to implement the SOCVC. A total of 47 Philippine Air Force (PAF) officers enrolled in the SOC participated in this study. Satisfaction in terms of learner interface, learning community, content and usefulness on the use of SOCVC was obtained using a questionnaire. The respondents are seen comfortable and satisfied with the use of the virtual classroom. Profile variables used in the study when taken separately do not show significant difference as to the variables that affect the use of Virtual Learning Environment (VLE) in civilian setting.

Keywords: Virtual classroom, Squadron Officer Course, VLE, MOODLE, Air force

1. Introduction

The use of a Learning Management System (LMS) is now being seen as the trend in course delivery in Higher Education Institutions (HEIs) in the Philippines. An LMS once established, may be called a Virtual Learning Environment (VLE) or a Virtual Classroom (VC). This is because all terms (LMS, VLE and VC) share the same purpose in simulating a physical learning environment that allows students to learn by viewing lessons in the form of presentation or video tutorial and to communicate and interact with one another using forum, chat, blog or web conferencing. Mostly, a VLE is used by an HEI to revolutionize the conventional face-to-face classroom encounter between students and teachers. Santy and Smith (2007) emphasized that e-learning strategies can be integrated in a VLE to make learners perform better. For example, a teacher can post course materials (lectures, presentations, etc.) in the VLE to be downloaded by the students. On the other hand, students may upload course requirements or take assessment test in the VLE. In addition, teachers and students can interact remotely using a built-in chat system. These are only few of the numerous features of a VLE.

HEIs aim to provide needed competencies to prepare students in their future work. On the other hand, Professional Military Education (PME) focuses on training military officers in communication, teamwork, leadership and management which are needed when they assume of higher responsibilities and functions in the future. According to Tung, et al. (2009, p.652), “The fundamental differences between civilian and military education are their goals, motivations and targeted applications”. However, military schools have similar generic function to HEIs, that is, to provide quality education and training to learners.

Computers and videos have long been used as training tools of the military (Herrington, Reeves and Oliver, 2007). While HEIs have been adopting VLE in their school agenda, studies of Armon (2006), Gruszceki (2011), Artino (2009) and Starr-Glass (2013) proved that foreign military schools are also implementing this kind of technology. Thus, military schools believe that by instituting a VLE in their training courses, learning experiences of their students will be enriched.

The Air Force Officer School (AFOS) as one of the major units of the Air Education and Training Command (AETC) in the Philippines is mandated to conduct PME and allied courses. This is to give air force officers advanced knowledge and skills on leadership, management, accountability and responsibility necessary to
prepare them for higher ranks and positions. Its vision is to become the leading center for leadership excellence and PME of the Armed Forces of the Philippines (AFP) in the year 2028 (The Red Book, p.3). The AFOS endeavors to create an ideal learning environment through adoption of contemporary teaching methodologies and instructional strategies and techniques.

One of the courses conducted in the AFOS is the Squadron Officer Course (SOC). The target participants of this course are all senior company grade air force officers. Officers of equivalent rank from foreign military organization may also be accepted in the SOC. The objective is to train the officers for middle-level command and staff duties. Moreover, it aims to provide professional development for higher responsibilities in the PAF by enabling them to think critically and to become efficient team players and excellent communicators.

The SOC has a duration of 640 hours distributed in six areas namely: Communication Studies, 101 hours; Military Strategy and Air Power Studies, 295 hours; Leadership and Management, 79 hours; Profession of Arms, 71 hours; Field Leadership and Physical Development, 48 hours; and Administration, 56 hours. The said course is usually taken within a 4-month period and is being offered by the AFOS twice a year. Teaching methodologies adopted include lectures, interactive sharing, practicum, group dynamics and tours.

It should be noted that AFOS, since its foundation has been successful in accomplishing its mission to train PAF officers without a VC. Hence, this kind of technology is not a priority of the organization. Since the concept has not been used before, there was really no opportunity to develop the system and the required human resources. However, the authors believe that the use of SOCVC has its advantages. Officers who may not be able to leave the critical positions they hold due to exigency of service, a VC can help these officers to do their SOC. As working students, using this technology they need not leave their stations or offices. This is also applicable to reserve officers who hold their respective occupations outside the military field. With this pilot study, it is hoped that the institutionalization of using VCs in the conduct of the SOC and other courses offered by the AFOS will be in reality.

At present, e-learning in the Air Force Officer School is in its early stage of implementation. A previous study conducted by Rayton (2013) reported that the Dropbox as an internet academic portal of SOC Class 2013-A was ineffective in improving the learning experiences of the students. It was only used for submitting assignments to replace regular email. He suggested the use of EDU 2.0, a cloud-based LMS to enrich the learning practice of the students. On the other hand, Nitura and Jimenez (2014) proposed the use of Webex to be able to design a working web-based mode of instruction. However, at the time of this writing, no LMS is yet to be established for the Squadron Officer Course.

Dwelling on the beauty of e-learning, the authors have come up with an idea of establishing a VLE, designed to sustain the face-to-face instruction in the AFOS. Specifically, this VLE is called Squadron Officer Course Virtual Classroom (SOCVC). This is established by utilizing the e-learning platform called Modular Object-Oriented Dynamic Learning Environment (MOODLE). This software platform provides interface modules for quizzes, assignments, blogs, forums and other useful guides for both students and teachers. Burgess (2008) and Sumak et al. (2011) are one in declaring MOODLE as a useful e-learning platform with numerous features that are available to make teaching and learning a meaningful experience.

The authors find the necessity to undertake initial steps in designing and establishing a working SOCVC for the AFOS. This paper aims to assess the level of satisfaction of the users of the said technology as well as to examine the profile variables of military students that influence satisfaction on the use of a VC. This study is expected to contribute to the existing knowledge in the field of military education. It is also hoped that the study will provide significant insights on ways to improve the delivery of the SOC pertaining to the use of the virtual classroom.

1.1 Research Questions

The study sought to find answers to the following questions:

1. What is the profile of the respondents in terms of age, sex, Information Communication Technology (ICT) skills and prior VC experience?
2. How do the respondents assess the SOC virtual classroom with respect to the dimensions learner interface, learning community, content and usefulness?
3. Is there a significant difference on the respondents’ assessment on the use of the SOC virtual classroom when grouped according to their profile variables?

2. Literature Review

2.1 E-learning in Military Organizations

Several military organizations have seen adopting e-learning in the training of its soldiers. A military program called eArmyU was contracted by the US Army to provide educational opportunities to soldiers in an online environment (Armon, 2006). Another initiative in developing the military human resources in the US includes the online training system called the Advanced Distanced Learning (ADL) system designed by the Department of Defense (Greiner, Beaulieu and Webb, 2007). Meanwhile, Kei et al. (2008) proposed an architecture of Advanced Military Education – Distance Learning (AME-DL) prototype which is a combination of advanced e-learning tools, simulation and web technology. This is to make military learning and training courses easily accessible anytime and anywhere through the use of Internet. The US navy was seen delivering self-paced online courses through its Navy e-learning system (Artino, 2009). The Command and General Staff College in the US has an 18-month web-based non-resident course which included several attributes like threaded discussions, Flash files of video instruction, chat rooms and online library access (Gruszecki, 2011). Starr-Glass (2013) reported the online learning experiences of students who were also US soldiers in the course Management and Organizational Design. His findings indicated that majority of the military learners felt their online distance education was constructive and enjoyable learning experiences. However, military learners were repeatedly seen struggling in their participation on online discussions.

Correspondingly, Newton and Ellis (2005) identified the factors namely drivers for change, training culture and learners’ needs as significant to the effective e-learning implementation in the Australian Army. They proposed that “relevant e-learning requires the responsive alignment of e-learning with the characteristics of the organizational culture” (p.394). Meanwhile, Gvaramadze (2012, p.4) argued “that an online virtual learning curriculum design differs from a traditional face-to-face classroom environment in terms of learning content, learning activities and nature of learning support”. On the other hand, Bonk and Wisher (2000) stressed the factors namely (1) cognitive and metacognitive, (2) motivational and affective, (3) developmental and social, and (4) individual differences, as important in transforming a classroom-centric to a soldier-centric model of instruction in an online learning environment.

2.2 Assessment of Virtual Classroom

The goal of assessing any Virtual Classroom (VC) was to attain a more effective teaching and learning environment. Since a VC is a web system, the Technology Acceptance Model (TAM) proposed by Davis (1989) is a suitable model in assessing the VC. Under this model, factors namely usefulness and ease of use, play vital roles on whether a user will continue to use a web system. In similar view, Cox and Dale (2001) and Riel et al. (2001) validated usefulness, ease of use and satisfaction as main drivers of continuous patronization among users of a system.

Chen (2003) defined satisfaction as a measure of pleasure and contentment. Correspondingly, Roca et al. (2006) believed that satisfaction is a significant predictor in the success and use of an information system. Moreover, Hills (2010) underscored the value of conducting student satisfaction survey upon completion of program modules to steadily improve the quality and performance of their online programs.

In 2009, Malik noted that “the student and instructor attitude towards technology, their computer efficacy, and instructor response, friendly interface of the online learning environment and proper facilitation of technical matters are the factors that influence student satisfaction towards online education” (p.1). Meanwhile, Chua and Montalbo (2014) compared graduate students’ satisfaction on the use of Management Control and Information System VLE as per learner interface, learning community, content and usefulness. They found out that “positive attitude is exhibited on the use of VLE regardless of gender while young and experienced users of e-learning platforms tend to be difficult to satisfy with regard on the use of VLE” (p.104).

2.3 Other Factors Affecting Virtual Learning Environment Implementation

According to Hills (2010), LMSs that begin with a more detailed student profile capturing all of the identified demographic characteristics into a consolidated student database would allow for the development of a much more comprehensive learning management system capable of automating many of the essential monitoring
functions. Yoo, Huang and Kwon (2015) stressed that gender difference must be considered in measuring the efficacy of e-learning among users.

Meanwhile, Prensky (2001) coined the words “digital natives” and “digital immigrants.” Digital natives are said to be born in 1980 and/or onwards (Palfrey and Gasser, 2008). They are said to be surrounded and fluent with various digital technologies like computers, cellphones, video cameras, etc. On the other hand, digital immigrants are those born prior to 1980. They did not grow up in a digital culture but they welcome the idea of using technology by studying and adopting it.

The Concordia University in Canada defined three levels of proficiency in using computer systems and programs namely; beginner, intermediate, and advanced. Sahin and Shelley (2008) noted that computer expertise influences e-learning satisfaction both directly and indirectly. Students who have more computer knowledge consider e-learning to be more flexible and useful, and consequently are more satisfied with it.

Artino (2007) surveyed 475 personnel from US Navy to understand students’ satisfaction, perceived learning and choice of online military training. He found out that students’ motivational beliefs about a learning task and prior experience are related to positive academic outcomes. In addition, students’ success in an online course can be explained, in part, by their motivational beliefs and prior experience with online instruction.

The foregoing literature and studies were reviewed by the authors to come up with the needed directions in developing the study. In the Philippines, studies pertaining to the use of e-learning in military setting are lacking. In summary, none of the literature and studies directly addressed the implementation of a VC in the AFOS particularly in the SOC class. In line with this, the authors attempted to conduct a study along this field.

3. Methodology

3.1 Participants

The study was conducted at the Air Force Officer School (AFOS) located in the Fernando Air Base, Lipa City, Philippines. Since the VC was designed and established for the Squadron Officer Course, the authors selected all the 51 air force officers currently enrolled in the Squadron Officer Course Class 2016-B as respondents of the study. They were required to use the established SOCVC for two months (September-October 2016) and complete the satisfaction survey. Of the 51 respondents, 47 completed the survey on time.

3.2 Procedure

Since a VC is not yet introduce in the AFOS, a letter of request addressed to the Vice President for Administration and External Affairs of Batangas State University (BSU) was made to allow the authors establish the SOCVC at the BSU VLE. BSU is a known university in the Philippines, open for research collaboration that

The study utilized the presented concepts by Cooch (2010) as well as Cole and Foster (2008) in the design and establishment of the SOC VC. Studies related to LMS conducted by Machado and Tao (2007), Bremer and Bryant (2005), Kei et al. (2008), Bonk and Wiser (2000), Burges (2008) and Sumak et al. (2011) contributed significant ideas in the design and establishment of the SOCVC. MOODLE was seen as the leading LMS platform due to its several advantages as cited in the studies of Machado and Tao (2007) and Bremer and Bryant (2005).

As mentioned, MOODLE is an open-source software and preferred by teachers, system administrators and students. It is also considered as the most popular e-learning platform (Cooch, 2010) and highly recommended by Fayed (2010), Cole and Foster (2008), Magdin and Burianova (2011) due to its modular interface, effectiveness, transparent administrative interface, security and numerous active community groups.

The SOCVC based on the MOODLE platform was intended to supplement face-to-face teaching in the SOC Class 2016-B. This was available and accessed by the students at http://vle.batstate-u.edu.ph from September to December 2016. Course settings such as the format, number of weeks, start date, gradebook, maximum upload size, allow guest access and group mode were tuned by the authors for better system operation of the SOCVC. All course materials and requirements were requested in advance from the Course Director. Seven modules of the SOC were included in the virtual classroom. These modules were: (1) Briefings for SOC Class 2016-B, (2) Academic Instructor Course Module, (3) Communicative Studies, (4) Military Correspondence and Publications, (5) Research Skills, (6) Leadership and (7) Management. Existing course materials in the AFOS
together with relevant activities pertaining to the said modules were posted in the virtual classroom. These were then uploaded in the virtual classroom based on the approved schedule dates of class meetings. In addition, there were sections in the virtual classroom requiring students to upload course requirements such as assignments, turn-ins and other written activities. Video files which are more than 5MB were not uploaded to save storage space and bandwidth. Table 1 shows the details of the SOCVC course materials and activities.

**Table 1: SOCVC Course Materials and Activities**

<table>
<thead>
<tr>
<th>Area/Module/Topic Title</th>
<th>Course Materials</th>
<th>Activities</th>
</tr>
</thead>
</table>
| 1. Briefings (6 ppt files) | Administrative, Academic & Decorum Briefing  
Facilities briefing  
Physical Development and Field Leadership Program Briefing  
IMS Briefing  
Financial Briefing | Discussion Forum 1  
Submission of Lesson Topic Guide (doc)  
Submission of Teachback Presentation (ppt) |
| 2. Academic Instructor Course (2 folders, 4 ppt, 6 doc files) | Academic Instructor Course Module (ppt)  
Lesson Preparation (ppt)  
Writing a good Objective (ppt)  
Lesson Topic Guide (ppt)  
Task verbs (folder with 3 doc files)  
Lesson topic guide (folder with 2 doc files)  
Teachback Rating Sheet (doc) | Submission of My Air Force Story  
Submission of Presentation for My Air Force Story  
Submission of Assumption/Relinquishment speech |
| 3. Communicative Skills (8 ppt, 2 doc files) | Principles of Effective Writing (ppt)  
Effective Writing Tips (ppt)  
Essay Writing for SOC(ppt)  
Delivering your Presentation (ppt)  
My Air Force Story Briefing File (ppt)  
My Air Force Story Rubric File (doc)  
Assumption and Relinquishment Lecture (ppt)  
Assumption/Relinquishment Speech Rating Sheet (doc)  
Debate (ppt)  
Asian Parliamentary Debate (ppt) | Submission of My Air Force Story  
Submission of Presentation for My Air Force Story  
Submission of Assumption/Relinquishment speech |
| 4. Military Correspondence and Publications (1 ppt, 1 folder with 11 doc files) | Military Correspondence Lecture (ppt)  
Samples and Format (folder with 11 doc files) | Military Correspondence Exercise (Online Text) |
| 5. Research Skills (4 ppt, 1 pdf, 1 doc files) | Writing Commandant’s Paper (ppt)  
Plagiarism (ppt)  
Writing your Commandant’s Paper (Final Chapter) (ppt)  
APA style (pdf)  
Commandant’s Paper Format (ppt)  
Commandant’s Paper Rating Sheet for Chapters 1-3 (doc) | Discussion Forum 2  
Submission of Commandant’s Paper (Chapters 1-3)  
Submission of Commandant’s Paper Presentation for Initial Defense |
Principles of Leadership  
Situational Leadership  
Full Range Leadership Model  
Followership  
COG’s Ladder  
APTEC Model  
Team Building  
Communicative Leadership  
Theories of Motivation  
The good, the bad and the ugly  
Mission  
People | Discussion Form 3  
Mission and People Quiz  
Situational Leadership Quiz  
Followership Quiz  
Team Building Quiz  
Leadership Quiz |
| 7. Management (19 ppt, 2 pdf files) | Introduction to Management (2 ppt)  
Management (pdf)  
Planning and Organizing (3 ppt)  
Controlling (2 ppt)  
Leading (ppt)  
Evolution of Management Theories (ppt)  
Management Tools (ppt)  
Problem Solving and Decision Making (ppt)  
Synectics Method (pdf)  
Organizational Behaviour (ppt)  
Defense System of Management (7ppt) | Defense System of Management Quiz  
Management Quiz |
Respondents were given their own account in the VC for them to have access to its contents and features. The authors conducted an orientation session to the students on how to use the VC. Demonstrations on how to download lectures, submit course requirements, participate in discussion forum were done in the orientation session. Figure 1 shows the screenshot of the established VC for the SOC.

Figure 1: Screenshot of the SOCVC

The VC presented in this study was just a supportive tool in the SOC. Thus, the students were still required to attend physically all the lectures on scheduled date and time at the designated classroom.

3.3 Instrument

Important studies related to assessment of a VC were authored by Chen (2003), Roca et al. (2006), Chua and Montalbo (2014), Riel et al. (2001), Artino (2007), Newton and Ellis (2005), Al-Khalifa (2008), Zafra et al. (2011), Bell and Farrier (2008) and Bunting (2003). These studies provided practical insights in the method of assessing VC. Furthermore, concepts of Technology Acceptance Model, Theory of Planned Behavior and the mentioned studies concerning user satisfaction on the use of VC were all considered in the development of the data gathering instrument.

The instrument used in the study of Chua and Montalbo (2014) was slightly modified by the authors to fit with the characteristics of the respondents of the study. Specifically, the items regarding the profile of the respondents and a non-mandatory portion for comments and suggestions regarding the VC were added in the questionnaire.

Preliminary items in the questionnaire determined the age, sex, ICT skills and previous VC experience of users. These profile variables came from ideas given by Palfrey and Gasser (2008), Sahin and Shelley (2008), Prensky (2001) and Mackenzie (2012). Main items on user’s satisfaction on the use of the VC were grouped in terms of learner interface, learning community, content and usefulness. The last part of the questionnaire aimed for comments and suggestions from the respondents.

Research experts from BSU were requested to examine the first draft of questionnaire in terms of its relevance and clarity. As a try-out, the second draft of questionnaire was fielded to 20 faculty members to determine its reliability. Data collected were analyzed using Cronbach’s Alpha run in the Statistical Package for Social Sciences (SPSS). All measurement items were found to be valid and reliable with an overall Cronbach’s Alpha value of 0.891. The finalized questionnaire was encoded using QuestionPro, a known online survey and analytics tool. Finally, the link of the online questionnaire was posted in the VC.
Feedbacks using a 4-point scale on each statement in the questionnaire were solicited from the respondents. Retrieval of the questionnaire was done on the last week of October 2016. Data gathered were analyzed and subjected to statistical analysis using SPSS.

4. Results and Discussions

4.1 Profile of the Respondents

Profile of the respondents is described in terms of age, sex, ICT skills and VC prior experience.

Table 2: Demographics of Respondents (N=47)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36 years old and below</td>
<td>32</td>
<td>68.09</td>
</tr>
<tr>
<td>37 years old and above</td>
<td>15</td>
<td>31.91</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>33</td>
<td>70.21</td>
</tr>
<tr>
<td>Female</td>
<td>14</td>
<td>29.79</td>
</tr>
<tr>
<td>ICT Skills</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beginner</td>
<td>7</td>
<td>14.89</td>
</tr>
<tr>
<td>Intermediate</td>
<td>40</td>
<td>85.11</td>
</tr>
<tr>
<td>Prior VC Experience</td>
<td></td>
<td></td>
</tr>
<tr>
<td>With Experience</td>
<td>9</td>
<td>19.15</td>
</tr>
<tr>
<td>Without Experience</td>
<td>38</td>
<td>80.85</td>
</tr>
</tbody>
</table>

As seen in Table 2, majority of the respondents are 36 years old and below (68.09%). With reference to the year 2016, majority of the respondents were born in 1980 onwards. This implies that most of the respondents are digital natives. Palfrey and Gasser (2008) described digital natives as people who are exposed in digital technologies. They are believed to be accustomed to the use of technology such as computers, cellphones and the likes. Thus, they are expected to enjoy and use the SOC VC with ease.

As per sex of the respondents, male respondents (70.21%) overshadow female respondents (29.79%). Even in a small course like this, the finding supports the idea of MacKenzie (2012) in which he cited that military is known to be a male-dominated organization. On the other hand, the finding also proves that PAF caters not only men but also women though in minority, in their organization. Even in other countries like US and Israel, the number of women in military is lesser but increasing (MacKenzie, 2012; Finestone et al., 2014).

Moving on, ICT skills are also considered in this study. If ICT literacy is not recognized and dealt with, the lack of ICT skills may undermine the efforts to use e-learning (Pretorius and Biljon, 2010). As per ICT skills, majority of the respondents claimed that they have intermediate skills in ICT (85.11%). This finding is parallel to the study of Martin (2013) who indicated that high percentage of AETC personnel is familiar with the use of internet. Intermediate skills in computer are characterized by ability to customize toolbars, import and insert graphs, embed spreadsheet data, and elaborate reports, understands the concepts of databases and able to work with charts and to use the list management capabilities of a spreadsheet, familiar with data validation and indexing techniques, customize templates and presentation software environment, and to make a presentation interactive by using hyperlinks and action buttons (Concordia University, 2011). Similarly, internet intermediate skills are demonstrated with the ability to append signature to email, recognize spam/security threats, understand internet structure, basic website creation and recognize file format (University of New South Wales, 2015). The finding appears that most of the PAF respondents are ready to use the virtual classroom. They are expected to maximize the usage of all the features of the VC with less effort and accuracy.

In addition, a big percentage (80.85%) of the respondents has no prior VC experience. This means that a LMS is not yet available during their college/university days. To initially acquaint the respondents to the VC, the authors have conducted an orientation regarding the features and steps on how to use the said technology. This is to make sure that the respondents are given enough information on the use of the VC as a support tool in the SOC.
As a whole, the profile of the respondents in terms of age, sex, ICT skills and prior VC experience are all taken into consideration in this study. These are believed to influence the respondents’ satisfaction on the use of the VC.

4.2 Assessment of Respondents’ Satisfaction on the Use of the SOC Virtual Classroom

Respondents’ satisfaction on the use of the VC is described based on the four dimensions namely; Learner Interface, Learning Community, Content and Usefulness. These dimensions also appear in studies conducted by Chua and Montalbo (2014), Chen (2003), Roca et al. (2006), Riel et al. (2001), Artino (2007), Newton and Ellis (2005), Al-Khalifa (2008), Zafra et al. (2011), Bell and Farrier (2008) and Bunting (2003).

4.2.1 Learner Interface

Learner interface deals with the acceptability of the colors, background, layout, buttons, links, fonts and navigation experience of the users. The standard MOODLE theme was used in this study in which the colors, background, etc. were in the default mode.

Table 3 shows the result of the assessment of respondents’ satisfaction on the use of the virtual classroom as per Learner Interface. As shown in Table 3, statements under the learner interface dimension obtain weighted means range from 3.19 to 3.34. Four statements are agreed and three statements are strongly agreed by the respondents. The 3.25 overall weighted mean signifies that respondents are satisfied with the overall design of the learner interface of the VC. More specifically, they find the visual design such as color, background, layout, etc. appropriate and appealing. MOODLE’s default learner interface theme works for the respondents. As Malik (2009) highlighted that friendly interface of the online learning environment is one of the factors which influence student satisfaction towards online education, the SOCVC is regarded to have a nice and friendly interface as shown with the agreements of the respondents on each statement. The finding shows similarity to the studies conducted by Chua and Montalbo (2014) and Popescu et al. (2010) in which learner interface of their respective VC where rated favorably by users. Overall, it can be said that respondents of this study are satisfied with the VC in terms of its learner interface.

4.2.2 Learning Community

Learning community refers to the ease of collaboration, discussion and sharing of information between students and lecturers. This is illustrated in the SOCVC through the use of the built-in chat system and discussion forums.

As manifested in Table 3, four statements are agreed and one statement is strongly agreed by the respondents. These mean that respondents value the learning community features of the VC. In an online collaborative learning, learners are able to interact and discuss with their peers, teachers or others conveniently in regard to their formal or informal studies (Koo, 2008). It can be deemed from the result that respondents admire the built-in messaging system and blogging features of the VC. These allow them to interact with their classmates, lecturer and the whole learning community. In summary, the overall weighted mean of 3.18 shows that the respondents agreed that learning community dimension of the VC is satisfactory.

4.2.3 Content

Content deals with the appropriateness, timeliness and presentation of the topics and other activities in the VC.

As exhibited in Table 3, three statements are strongly agreed and four statements are agreed by the respondents as per the content of the VC. As Gvaramadze (2012) mentioned that appropriate online content is crucial in online virtual learning environments, the authors have carefully organized and selected the course materials to be included in the VC. These course materials came from the course director given by the lecturers of the SOC. Overall, the finding indicates that respondents are satisfied with the content of the VC.
As can be gleaned in Table 3, the respondents strongly agreed the four statements and agreed one statement regarding the usefulness of the VC. This shows that the respondents believed that the VC is very useful as a support tool in the SOC. The finding differs in the study of Rayton (2013) who revealed that the internet academic portal used by the AFOS was not instrumental in students’ learning. As Sanchez et al. (2013) confirmed that WebCT (a proprietary LMS) usage and acceptance is directly influenced by perceived usefulness, it is deemed in this study that the respondents acknowledge and will continue to use the VC throughout the course because they found it useful. Hence, the respondents are convinced that the VC is beneficial to them as SOC students.

Summing up, the obtained means in all statements presented for the dimensions learner interface, learning community, content and usefulness, reveal that respondents are satisfied with the VC. Hence, there is no doubt that designed and established VC can be used as a supportive tool in the delivery of SOC.

2.4.5 Comments/Suggestions of the Respondents

It should be noted that part of the questionnaire is an open-ended space where respondents can voice out their comments and/or suggestions regarding their experience with the SOC VC. Positive remarks made by the respondents with regard to their use of the VC are the following:

“This is very helpful to all students of SOC especially when we need the compilation of lectures that is very accessible here in the site.”

“It’s a good idea to use this method to help the students especially in AFOS to learn.”
“Very useful.”

“Nice idea.”

“I hope to see this technique in other courses of PAF.”

“Helpful to Non-Resident Instruction (NRI) students.”

“The VC should be implemented at the AFOS as soon as possible because it is very useful to the students who are taking the SOC.”

“Good for additional learning.”

Some respondents also voiced their concerns based on their experience using the VC.

“Security is the main factor here. The VC is hosted by Batangas State University. Chances that students from BSU can access the confidential course materials of the SOC.”

“How secure is the VC?”

“This is not applicable to active regular students. Applicable only to NRI students.”

In terms of security, concerns expressed by the respondents are similar to the study of Wang et al. (2012) who cited that students did not feel safe and comfortable in the use of Facebook as LMS. In this study, though the VC is hosted in Batangas State University, one may need an account and enrolled manually by the lecturer before a student can access the VC. The enrollment setting is set manually to avoid unwanted course registration from guests of the website. Hence, only the students enrolled manually by the lecturer can access the course materials and activities of the SOC VC.

On the issue of applicability of the VC, the authors disagree with the respondent’s view that this technology is not applicable to regular students of the SOC. Perhaps, the respondent perceived that regular students need not attend the regular classes and will rely solely to the VC to acquire the knowledge and skills. It is a clear fact in the beginning that the VC is just a supportive tool for the SOC. As a support tool, students are required to attend their face-to-face lecture with the lecturer and utilize the VC to download lectures, submit assignments and accomplish activities and quizzes.

Several respondents made recommendations on how to improve the VC.

“The quizzes are a bit difficult to answer due to time constraints. I hope it will be set to more than 5 minutes.”

“It is better if we can upload a file more than SMB at least, a 25MB capacity.”

“Since all students do not have good vision as an effect from their ages (I mean some of our classmates are more than 40 years old), it would be better if the size of the font is increased.”

The SOC VC quizzes include time settings to make the test more challenging and minimize the tendency of the students to open and read their notes. Uploading of files is limited to SMB to save storage space since the VC is only at testing stage. Standard font sizes are used in the design of the VC. For students who do not have perfect vision, they may adjust the font size by pressing keys Ctrl + in the keyboard.

Overall, it can be seen that the respondents welcome and appreciate the designed and established VC for the SOC Class 2016-B.
4.3 Test of significant difference on the assessment of respondents’ satisfaction on the use of VC when grouped according to their profile variables

As per profile variable age, the computed p-values (0.469, 0.647, 0.635, 0.540) as shown in Table 4 are all greater than 0.05 level of confidence in the four dimensions of respondents’ satisfaction. Based on the p-values obtained, the study failed to reject the null hypothesis. Hence, there is no significant difference on the respondents’ level of satisfaction on the use of VC when they are grouped according to their age.

Table 4: Comparing Age

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>36 &amp; below (n=32)</th>
<th>37 &amp; above (n=15)</th>
<th>T</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learner Interface</td>
<td>3.28 ± 0.37</td>
<td>3.19 ± 0.46</td>
<td>0.731</td>
<td>0.469</td>
</tr>
<tr>
<td>Learning Community</td>
<td>3.20 ± 0.47</td>
<td>3.13 ± 0.51</td>
<td>0.461</td>
<td>0.647</td>
</tr>
<tr>
<td>Content</td>
<td>3.26 ± 0.46</td>
<td>3.19 ± 0.48</td>
<td>0.477</td>
<td>0.635</td>
</tr>
<tr>
<td>Usefulness</td>
<td>3.33 ± 0.51</td>
<td>3.23 ± 0.60</td>
<td>0.618</td>
<td>0.540</td>
</tr>
</tbody>
</table>

degrees of freedom: 45  
level of confidence: 95%

Similarly, in terms of profile variable sex, the p-values (0.244, 0.335, 0.292, 0.471) as seen in Table 5 are all greater than 0.05 level of confidence in the four dimensions of respondents’ satisfaction. With reference to the p-values obtained, the study failed to reject the null hypothesis. Thus, there is no significant difference between male and female respondents’ level of satisfaction on the use of VC.

Table 5: Comparing Sex

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Male (n=33)</th>
<th>Female (n=14)</th>
<th>T</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learner Interface</td>
<td>3.21 ± 0.37</td>
<td>3.36 ± 0.42</td>
<td>-1.179</td>
<td>0.244</td>
</tr>
<tr>
<td>Learning Community</td>
<td>3.14 ± 0.50</td>
<td>3.29 ± 0.44</td>
<td>-0.976</td>
<td>0.335</td>
</tr>
<tr>
<td>Content</td>
<td>3.19 ± 0.47</td>
<td>3.35 ± 0.45</td>
<td>-1.066</td>
<td>0.292</td>
</tr>
<tr>
<td>Usefulness</td>
<td>3.26 ± 0.58</td>
<td>3.39 ± 0.44</td>
<td>-0.727</td>
<td>0.471</td>
</tr>
</tbody>
</table>

degrees of freedom: 45  
level of confidence: 95%

Also, as per profile variable ICT skills, the p-values (0.955, 0.684, 0.651, 0.607) as illustrated in Table 6 are all greater than 0.05 level of confidence in the four dimensions of respondents’ satisfaction. Using the p-values as reference, the study failed to reject the null hypothesis. Therefore, there is no significant difference on the respondents’ level of satisfaction on the use of VC when they are grouped according to their ICT skills.

Table 6: Comparing ICT Skills

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Beginner (n=7)</th>
<th>Intermediate (n=40)</th>
<th>T</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learner Interface</td>
<td>3.24 ± 0.43</td>
<td>3.25 ± 0.40</td>
<td>-0.057</td>
<td>0.955</td>
</tr>
<tr>
<td>Learning Community</td>
<td>3.25 ± 0.43</td>
<td>3.17 ± 0.49</td>
<td>0.410</td>
<td>0.684</td>
</tr>
<tr>
<td>Content</td>
<td>3.16 ± 0.49</td>
<td>3.25 ± 0.46</td>
<td>-0.455</td>
<td>0.651</td>
</tr>
<tr>
<td>Usefulness</td>
<td>3.20 ± 0.38</td>
<td>3.32 ± 0.56</td>
<td>-0.518</td>
<td>0.607</td>
</tr>
</tbody>
</table>

degrees of freedom: 45  
level of confidence: 95%

Furthermore, as per profile variable prior VC experience, the p-values (0.425, 0.636, 0.490, 0.110) as shown in Table 7 are all greater than 0.05 level of confidence in the four dimensions of respondents’ satisfaction. Considering the p-values obtained, the study failed to reject the null hypothesis. Thus, there is no significant difference between respondents with prior VC experience and respondents with no prior VC experience in their level of satisfaction on the use of VC.
The findings highlight the factors such as age, sex, ICT skills and prior VC experience does not affect the respondents’ satisfaction on the use of the VC as per learning interface, learning community, content and usefulness. As per sex, the result is parallel to the studies of Cheng (2011) and Majeed (2010) who disclosed that e-learning satisfaction between male and female respondents did not have significant difference. On the other hand, results pertaining to ICT skills differ in the studies of Armon (2006), Sahin and Shelley (2008) and Gomezelj and Civre (2012) that revealed computer/technological expertise influence e-learning satisfaction. Moreover, the results presented are not parallel to the study of Machado and Tao (2007) who accounted that students felt that their previous experience with learning management systems helped them to acclimate to the new system faster. Furthermore, the findings also differ in the study of Chua and Montalbo (2014) as per age and prior VC experience in which they concluded that young and experienced users of LMS tend to be difficult to satisfy. Nevertheless, the above mentioned studies are conducted in civilian settings. Therefore, it is interesting to note that in military organization like the PAF, the findings yield different results.

5. Conclusion

The study aimed to assess the level of satisfaction of students on the use of the Squadron Officer Course Virtual Classroom. Air force officer-respondents were found to be digital natives, male, having intermediate ICT skills and without prior VC experience. They were satisfied on the use of the VC in the SOC. The dimensions (learner interface, learning community, content and usefulness) of the VC were rated favourably by the respondents. The VC using the MOODLE’s default theme, built-in chat system, discussion forums, and other online activities fascinated the respondents. The VC can be used as a supportive tool in the delivery of the SOC. The study provided empirical evidence that demographic profiles such as age, sex, ICT skills and prior VC experience do not influence the level of satisfaction of students on the use of a virtual classroom.

The high appreciation and approval from the respondents regarding the use of the said technology suggested it is time for the AFOS to officially integrate the VC in the SOC as well as in other professional military education courses. This may be done by institutionalizing the use of virtual classroom to promote access to learning. The established VC in this paper may be enhanced by adding more modules, course materials and activities.

The study found some evidences contrary to existing literatures pertaining to the profile variables namely age, sex, ICT skills and prior VC experience and their connection to satisfaction on the use of a VC. This had opened a new argument on adult-learning theory which requires more investigation using both quantitative and qualitative techniques to explore the reason why these results occurred. Researchers may also validate the findings by replicating the study taking other military organizations in foreign countries as subjects.

The study is hoped to be an input for the AFOS in its vision to become the leading center for leadership excellence and PME of the AFP by creating an ideal learning environment through adoption of contemporary teaching technologies, strategies and techniques, particularly the SOCVC.

Similarly in every study, this paper had limitations that can be the basis of further studies. This paper was an initial study to obtain ideas and views on the adaptation of a VC in the SOC. It did not examine the specific level of learning obtained by the participants using the SOCVC. Hence, an experimental research can be proposed in this context. The paper only highlighted the satisfaction levels of the participants grouped in four dimensions namely, learner interface, learning community, content and usefulness. It is recommended that more researches should be conducted focusing on other aspects of VC implementation such as cost effectiveness, impact, teaching and learning styles.
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Factors Influencing the Adoption of e-Learning in an Open and Distance Learning Institution of Pakistan

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Abstract: The revolution in technology has led to new approaches toward open and distance learning, particularly in the form of e-learning. E-learning governs the system of modern education by using Information and Communication Technology (ICT). There are different design approaches and interpretations of e-learning, primarily involving variations in instructional strategies and pedagogical models employed with the technology. These innovations offer compelling opportunities to educational institutions, students and faculty alike, yet they have also posed formidable challenges for e-learning. This is especially the case in the developing countries. This paper engages the concept and aims of e-learning with regard to the issues in the developing countries. The next part of the paper presents the need of e-learning in Pakistan and describes the major institutes offering e-learning and distance education as an alternate mode of education. The paper also elaborates major challenges of e-learning and explores the influencing factors for the adoption of e-learning in Pakistan. The important factors are investigated in terms of available ICT infrastructure and other country specific parameters. The paper also presents results of a survey that was conducted to evaluate students’ preferences regarding e-learning. The survey result demonstrates a strong preference for e-learning by the students. The paper concludes by presenting a generalized model of e-learning that can fulfill the needs of learners under available technology infrastructure.

Keywords: E-learning, open and distance learning, Information and Communication Technology, Pedagogy, factors, infrastructure

1. Introduction

Open and Distance Learning (ODL) is a non-traditional mode of schooling which is characterized by separation of students and teachers in place or time (Modesto and Gregorios, 2016). The geographical and time separation is managed by alternate means of instruction delivery to distant learners. ODL is a form of second chance for school leavers who fail to get formal education. It is especially an opportunity for girls at home who are unable to get education in the formal system of education due to financial, cultural or other reasons (Abimbola, Omolara and Fatimah, 2015). Therefore it provides a flexible opportunity in which students can manage learning time and contents at their own pace (Perraton, 2012). The alternate delivery mode is influenced by the evolution of information and communication technology. As a result, e-learning has emerged as a process of education and training through technology (Naidu, 2006).

E-learning covers various aspects of computer and technology including internet based learning also called online learning. Ong, Lai and Wang (2004) highlights e-learning as instructional tutorial or learning practice delivered using electronic technologies including the Internet, intranets and extranets. Markus (2008) conceptualizes e-learning as an instructional process formed by interaction with digital content by using communication network and services and teacher’s support in a distant learning environment. Therefore, technology and pedagogy are integral components of e-learning (Moore et al., 2011), where some elaborations are closely linked with technological aspects; and others focus upon pedagogical approaches of learning mechanisms using different instructional strategies (Hadjerrouit, 2007). These different forms of e-learning pose various issues and challenges which vary from technology to pedagogy especially among the developed and the developing countries.

Developed countries are more industrialized and have high per capita income levels relative to other less developed or developing nations. This gap creates an economic and digital divide that can be observed in both classes of societies (Ravenhill, 2017). The ICT infrastructure is more advanced and available to a wider community in the developed countries. On the other hand the developing countries are striving hard to...
improve their technology lines (Chang, Wong and Park, 2016). Consequently the status of e-learning i.e. instructional strategies, learning technology and pedagogical model (Dabbagh, 2005) in the developing counties is different from the developed ones. Learning technology has the central role which facilitates the pedagogical model via asynchronous & synchronous communication tools, hypermedia & multimedia contents, and web based interactive communications. However it requires the availability of ICT infrastructure for remote learners, which is a challenge in most of the developing countries. The pedagogical model is a teaching practice, which includes open, flexible and distributed mechanisms to foster students' learning under the available technology infrastructure. Instructional strategies include exploration of learning materials, problem solving activities, localized expression, and reflection, which needs to be addressed in the low and medium-tech countries, especially Pakistan.

Keeping in view the above considerations, this paper is study about the status of e-learning in developing countries, taking Pakistan as a case study. The objective is to explore the factors that influence the adoption of e-learning in an ODL institution of Pakistan. The paper brings to light the availability of technological facilities necessary for e-learning, preferences of students and hurdles in adoption of e-learning through a survey conducted from the students of country’s largest Open University. The rest of the paper is organized as: section 2 summarizes the issues of e-learning in the developing countries, section 3 presents the status of e-learning in Pakistan and highlights the associated challenges and opportunities, section 4 presents the research methodology and discusses the results of the survey conducted from students of Allama Iqbal Open University (AIIOU). Finally, section 5 concludes the paper.

2. E-learning in Developing Countries

Use of ICT in education in developing countries has progressively advanced during the last two decades due to improvements in technology and service infrastructures; including wider availability, and strength of Internet connections (Omidinia, Masrom and Selamat, 2011; Williams, Mayer and Minges, 2011). This has enabled new and increased opportunities for teaching and learning. However, challenges such as interactive learning with active participation of students are still lacking and educational systems are still relying on more traditional approaches that have yet to leverage the dividends of technological and pedagogical innovations (Andersson and Grönlund, 2009). There are many issues of e-learning in developing countries; some major challenges are summarized in table 1.

Table 1: Challenges of E-Learning in the Developing Countries

<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andersson (2008)</td>
<td>Sri Lanka</td>
<td>Student support system, flexible learning in terms of anywhere anytime, infrastructure accessibility, confidence based on previous experience of learning, locally prepared materials and attitude towards e-learning acceptance.</td>
</tr>
<tr>
<td>Mnyanyi, Bakari, and Mbwette (2010)</td>
<td>Tanzania</td>
<td>Low Internet bandwidth, expertise in e-learning; ICT infrastructure, availability of funds, cost of e-learning equipment and after sale service.</td>
</tr>
<tr>
<td>Omidinia, Masrom and Selamat (2011)</td>
<td>Iran</td>
<td>Enabling processes, lack of e-learning expertise, proper use of open source systems and one-time funding</td>
</tr>
<tr>
<td>Khan, Hasan, &amp; Clement (2012)</td>
<td>Bangladesh</td>
<td>Technical infrastructure, computer skills, lack of funds, political situation, lack of policies, time and cost of development.</td>
</tr>
</tbody>
</table>

Students in many developing countries also struggle with personal confidence and literacy associated with use of technology (Tarus, Gichoya and Muumbo, 2015), experience of use and available local infrastructure (Kahiigi, et al., 2011). The technology confidence model needs to be enhanced with a consistent, open-ended, less expensive, and equally distributed local ICT infrastructure. The technology based learning environments require special considerations of socio-cultural norms of the learners (Masoumi and Lindström, 2012). These include language, traditions, culture, religion, and ethics. Therefore, specific material or wording in course instructions may not be suitable to all and may create a clash of cultural identity among learners. Developing countries, especially Pakistan, are also facing power failure issues. There is a need to give more freedom and
flexibility to learners by allowing learner-led activities at their own pace and schedule to accommodate these personal and infrastructure issues.

3. E-learning in Pakistan

Pakistan is a developing country that is progressing to enhance the educational standards from early childhood to higher education. The overall situation in terms of enrolments, number of institutions, and teachers has shown improvement in educational sector (Pakistan Economic Survey, 2016). However, the present infrastructure is insufficient to meet the needs of higher education. Major problems of education in Pakistan include a lack of trained teachers, deficiency of proper teaching materials, non-availability of facilities, assessment systems and inadequate resources (Bilal and Khan, 2012; Memon, 2007). The lack of resources in the country is affecting the socio-economic growth of the country. This has motivated interest in, and efforts to create alternative solutions in the form of distance education and e-learning.

In Pakistan there are two distance education universities (1) Allama Iqbal Open University (AIOU) and (2) Virtual University of Pakistan (VU). AIOU was established in 1974 as first Open University in country and second in the world. It is the only Mega University in the country. Traditional distance education is the primary mode of instructional delivery, covering a major portion of AIOU’s educational programs. The university is also providing online education in selected programs and courses (Vice Chancellor Annual Report, 2016). The model of online learning at AIOU is conceptualized as the Open Learning Institute of Virtual Education (OLIVE) and subsequently many e-learning activities have been initiated (Sangi and Ahmed, 2015). A model of multimedia instruction object development was presented for AIOU courses (Daud, 2009). The delivery mechanisms were established to provide for accessibility of online courses to distant learners (Sangi, 2009). The e-assessment services were developed under the organizational rules using the local technology infrastructure (Sangi, 2008).

The second distance learning institute is the Virtual University (VU), which was established in 2002 under a project initiated by IT and Telecommunication Division, Ministry of Science and Technology, Government of Pakistan. VU offers modern distance learning programs using ICT based services (Virtual University of Pakistan, 2016). The VU mostly relies on video lectures developed for each academic course and broadcast over VU TV channels. VU provides local laboratories for students to come, practice or listen to video lectures and take online examinations. VU also uses Internet to disseminate lectures and for submission of students’ assignments (Ali, Ahmed, Shaikh and Bukhari, 2011). Both universities are trying their level best to provide e-learning programs. However, they are coping with certain common issues and challenges of e-learning that need to be tackled properly. The study (Sangi and Ahmed, 2015) revealed that students’ accessibility and outreach have grown considerably with the passage of time that has encouraged more students to adopt e-learning programs. However, existing e-learning programs are facing some challenges that need to be addressed effectively.

3.1 Challenges of E-learning in Pakistan

The table 2 reveals various challenges of e-learning in Pakistan. The power crisis is one of Pakistan’s major hurdles in promoting e-learning in the country. The other infrastructure problem includes the Internet bandwidth. The present prevailing models of e-learning are sought from technologically advanced countries. These models do carry International standards of e-learning but with least emphasis on localization. Therefore, the use of instructional design in e-learning is rare in the localized environment. The accessibility of e-learning services has also not been considered for distant learners. There are pedagogical issues like the majority of students only have the ability to understand basic simple English. The formal text books designed for the traditional face-to-face learners are not suitable for distant learners. The multimedia contents are not available to meet the diverse needs of distant learners.
Table 2: Challenges of E-Learning in Pakistan

<table>
<thead>
<tr>
<th>Challenges</th>
<th>Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity issues</td>
<td>Sangi (2008); Iqbal, and Ahmad. (2010)</td>
</tr>
<tr>
<td>Absence of utilization of an Instructional</td>
<td>Daud (2009)</td>
</tr>
<tr>
<td>Design Process</td>
<td></td>
</tr>
<tr>
<td>E-learning accessibility</td>
<td>Sangi (2009)</td>
</tr>
<tr>
<td>Diversity in educational environments:</td>
<td>Nawaz and Kundi (2010)</td>
</tr>
<tr>
<td>Borrowed model of e-learning</td>
<td>Nawaz and Zubair (2012)</td>
</tr>
<tr>
<td>Internet bandwidth</td>
<td>Sana and Mariam (2013); Sajid and Hassan (2013)</td>
</tr>
<tr>
<td>English language competency</td>
<td>Qureshi et al (2012)</td>
</tr>
<tr>
<td>Learning styles</td>
<td>Hameed, Shaikh and Hameed (2012)</td>
</tr>
<tr>
<td>Traditional books/lectures</td>
<td>Ahmed and Sangi (2017)</td>
</tr>
<tr>
<td>Unavailability of multimedia contents</td>
<td>Ahmed and Sangi (2017)</td>
</tr>
</tbody>
</table>

In order to focus on afore mentioned issues, there is a need for a generalized e-learning model for Pakistan which should comply with both national and international parameters. The available local ICT infrastructure and preferences of local learners may be evaluated to address the needs of local learners. These standards may be employed as an opportunity for the development of a generalized e-learning model.

3.2 ICT Infrastructure for E-learning support

ICT plays a vital role for disseminating e-learning programs. It handles and manages the delivery and communication through the use of computers and Internet. There are various parameters and services of ICT contributing in the evolution of e-learning in Pakistan.

3.2.1 Growth of ICT Industry

The Government of Pakistan has established a separate entity, the Ministry of Information Technology (Ministry of Information Technology, 2016), to promote the ICT industry. The country is facing electricity power failures, yet even in these challenging conditions, the ICT revolution in country is moving forward at a faster pace. The ICT industry in Pakistan generates over two billion UD dollars in revenue each year, which shows significant growth in ICT in recent years (Pakistan Software House Association, 2016). The number of computers in Pakistan has also increased by 35% during the last decade, adding around 450,000 new computers each year (Sajida, 2013). At present, ICT has become an integral tool for many individuals, offices, homes and business centers. Many new opportunities are available in various governmental and non-governmental organizations to support ICT infrastructure, IT business, software development, and service sector. Similarly, IT education has also grown in almost all institutions of learning.

3.2.2 Internet Broadband Subscribers:

Another important parameter is the number of Internet broadband subscribers in the country. The facts (Pakistan Telecommunication Authority, 2017) are given in figure 1:

![Figure 1: Broadband Subscribers](image)
The analysis indicates that the number of Broadband subscribers is increasing at an exponential rate. There is an almost ten times increase in the number of users in the last six years, demonstrating that access to the Internet is increasing with the passage of time. The government has been promoting Internet facilities in far-flung areas. Approximately 50 Internet Service Providers (ISP) are providing Internet connections throughout the country (Internet Service Providers Association of Pakistan, 2017).

3.2.3 Cost of Internet:

The government is allowing new companies to offer Internet broadband services in Pakistan. As a result, the cost of Internet access in Pakistan has reduced to a great extent over the past few years (Pakistan Telecommunication Authority, 2017). Many service providers offer special packages for students and teachers. The ability to receive Internet access at a reasonable cost may become one of the driving forces to promote e-learning based academic programs.

3.2.4 Introduction of 3G/4G Technology:

The mobile phone operators in Pakistan are offering 3G/4G technologies to subscribers with high-speed Internet at reasonable rates (Pakistan Telecommunication Authority, 2017). It enables them to download and play indigenous multimedia e-content.

There are various challenges of e-learning in Pakistan as reported in the literature review (table 2), but there is a bright future ahead as various opportunities are also available. The ICT indicators also reveal that the use of computers, Internet and mobile technologies are continuously increasing in the country, moving the society further toward an ICT enabled culture in the country. The potential of computers and Internet can be an asset to promote e-learning activities in the country. The ICT support parameters provide capability to support adaptable e-learning models through inexpensive and fast instructional delivery. The specialized e-learning models may be developed and deployed across the local networks. In order to utilize the potential of ICT for specialized e-learning models, access to computers and Internet among students was further investigated. The e-learning survey was conducted from Computer Science students at AIOU. The next section discusses the survey results.

4. Research Methodology

4.1 Research Design:

The survey research methodology was applied in the study. A questionnaire containing closed-ended questions based on Likert scale was developed. The questionnaire was validated through educational technology experts. It was modified in light of feedback and the final questionnaire comprised of three main sections i.e. personal information, e-learning challenges and preferences.

4.2 Sampling and Population

The research study selected the students in two major programs i.e. Bachelor of Science in Computer Science: BS (CS) and Post Graduate Diploma in Computer Science: PGD (CS) at AIOU. As many as 400 students from main campus and five (05) AIOU study centers across the country were selected and given questionnaires. The sampling scheme and response is given in table 3:

<table>
<thead>
<tr>
<th>Table 3: Sample &amp; Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forms Distributed</td>
</tr>
<tr>
<td>400</td>
</tr>
</tbody>
</table>

These responses are analyzed using SPSS and Excel packages and results are presented below:

4.3 Survey Results

4.3.1 Demographics:

The demographics results are shown in figure 2. The demographic results were evaluated in terms of the geographical location of respondents. The results reveal that a large proportion of respondents (73.4%) are living in urban areas, whereas 9.9% live in semi-urban environments, and 16.7% are from far-flung areas. The results confirm that CS programs of AIOU have spread successfully to rural and semi-urban areas. During the
analysis of their program of study, it was found that a large number of the respondents (71.4%) are studying in 16 years BS (CS) and 28.6% are pursuing PGD (CS). The results further highlight that a sizeable number of respondents got employed during their studies (32.9% private employee, 16.3% government employee and 50.8% unemployed). Approximately half of the students are managing both work and study at the same time. This illustrates the great potential for e-learning as an alternative teaching mode. The demographic analysis also revealed that a large majority (71.4%) belong to 21-30 year of age bracket. The 17.9% students are younger than 20, and 8.3% are 31-40 year of age. While the majority of students are 21-30, it is interesting to note that senior citizens by the ratio of 2.4% are also found among AIOU students.

![Figure 2: Student’s Demographic Profile](image)

**4.3.2 Device Accessibility:**

The analysis of device accessibility by location is given in table 4. The mean value 3 or above is considered favorable to the device accessibility as 5 was the highest positive point on a likert scale 1-5. The results of table 4 show that respondents have access to ICT devices. The mean values of computers & laptops for urban and semi urban areas are 4.3 and 4.2 respectively showing that the devices are highly accessible in these locations. However, these are slight less accessible in rural areas because mean value is slightly less i.e. 3.7.

Similarly the value is above than 3.5 for location parameter indicating high mobile phone intensity in urban, semi urban and rural areas. The mean of broadband at home for semi urban respondents is 4.1 as compared with 3.9 for urban and 2.7 for rural households which indicates that that the broadband at home is more accessible in semi urban and urban areas and less accessible in rural areas. However, the broadband at institution/office is almost equally accessible to students of all areas. The same is the case of mobile Internet.
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Table 4: Device Accessibility by Location  

<table>
<thead>
<tr>
<th>ICT Devices</th>
<th>Urban</th>
<th>Semi Urban</th>
<th>Rural</th>
<th>Chi-Square</th>
<th>P - Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>Computer /Laptop</td>
<td>4.3</td>
<td>1.0</td>
<td>4.2</td>
<td>0.9</td>
<td>3.7</td>
</tr>
<tr>
<td>Mobile Phone</td>
<td>3.9</td>
<td>1.2</td>
<td>4.0</td>
<td>1.4</td>
<td>3.5</td>
</tr>
<tr>
<td>Broadband (e.g. DSL) at home</td>
<td>3.9</td>
<td>1.4</td>
<td>4.1</td>
<td>0.7</td>
<td>2.7</td>
</tr>
<tr>
<td>Broadband Institution/Office</td>
<td>3.1</td>
<td>1.4</td>
<td>3.3</td>
<td>1.3</td>
<td>3.3</td>
</tr>
<tr>
<td>Mobile Internet</td>
<td>3.0</td>
<td>1.4</td>
<td>2.9</td>
<td>1.2</td>
<td>3.1</td>
</tr>
</tbody>
</table>

The significant level (p - value) for computer/laptop, mobile phone and broadband at home is less than 0.05 which reveals that strong association exists between the location and accessibility variables. It shows that computer/laptop, mobile phone and broadband at home are more accessible to students residing in urban and semi-urban areas as compared to rural areas. The further results show that p-value is greater than 0.05 in case of broadband at office and Mobile Internet and, therefore, has no significant difference for urban, semi-urban and rural areas.

The analysis of device accessibility by gender is given in the table 5. The results of table 5 show that respondents have access to ICT devices. The mean values of computers & laptops for male and female are 4.3 and 4.2 respectively, which shows that most of the male and females students have their own computers or laptops. In case of mobile phones, the mean value is 3.8 for both genders showing high accessibility of mobile phones. The use of Broadband (e.g. DSL) at home has been found a slight greater among female as compared to male respondents. However, the use of Broadband at Institution/Office is slightly more among male than female respondents. Furthermore, the mean value for Mobile Internet is more for female (3.1) as compared to male (2.9). However, the significance level (p value) is greater than 0.05, which shows that there has not been found any significant difference regarding device accessibility among male and female students. The analysis is identifying various opportunities of instruction delivery using ICT devices. The sample has been taken from the largest distant learning institute of the country; therefore, this study will be helpful to the policy makers who want to introduce new programs using ICT and modern distant learning tools.

Table 5: Device Accessibility by Gender  

<table>
<thead>
<tr>
<th>ICT Devices</th>
<th>Male</th>
<th>Female</th>
<th>Chi-Square</th>
<th>P - Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Computer /Laptop</td>
<td>4.3</td>
<td>1.0</td>
<td>4.2</td>
<td>1.0</td>
</tr>
<tr>
<td>Mobile Phone</td>
<td>3.8</td>
<td>1.3</td>
<td>3.8</td>
<td>1.2</td>
</tr>
<tr>
<td>Broadband (e.g. DSL) at home</td>
<td>3.8</td>
<td>1.4</td>
<td>4.1</td>
<td>1.1</td>
</tr>
<tr>
<td>Broadband Institution/Office</td>
<td>3.1</td>
<td>1.4</td>
<td>2.9</td>
<td>1.4</td>
</tr>
<tr>
<td>Mobile Internet</td>
<td>2.9</td>
<td>1.3</td>
<td>3.1</td>
<td>1.3</td>
</tr>
</tbody>
</table>

4.3.3 E-learning Issues:

The analysis of e-learning issues as highlighted by respondents is given in table 6. The majority of respondents (85.2%) identified electricity as the most critical issue hindering successful implementation of e-learning. Users have to wait long times for electricity supply to resume their e-learning activities. The alternate electricity mechanisms may be used to overcome the shortage of electricity. However the ICT infrastructure including Internet was available as majority of respondents believe that infrastructure and Internet broadband are no
more problems for them to participate in e-learning activities. The other obstacles towards e-learning in accordance with the opinion of majority of respondents 82.95%, 64.7% and 62.55% are English language competency, dependency of teacher and unavailability of specialized contents, respectively. The existing contents are static in nature and cannot meet the dynamic need of distant learner. The language barrier creates extra burden on them and therefore the dependency of teacher remains a requirement. The e-learning contents require more interactivity than the traditional contents. The use of simple English and localized examples may help to understand the contents and reduce the dependency on teachers. The findings confirm the investigation of e-learning issues mentioned in table 6.

Table 6: E-learning issues

<table>
<thead>
<tr>
<th>e-learning issues</th>
<th>Response (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Electricity issues</td>
<td>85.2</td>
</tr>
<tr>
<td>English Language Competency</td>
<td>82.95</td>
</tr>
<tr>
<td>Dependency on teacher</td>
<td>64.7</td>
</tr>
<tr>
<td>Unavailability of Specialized Contents</td>
<td>62.55</td>
</tr>
<tr>
<td>Lack of Infrastructure</td>
<td>38.15</td>
</tr>
<tr>
<td>Internet Bandwidth</td>
<td>35.75</td>
</tr>
</tbody>
</table>

4.3.4 E-learning Preferences:

E-learning preferences have also been investigated to find the liking of students about e-learning. The analysis of respondents is given in table 7. The results reveal that the respondents are keen to have e-learning facilities from AIOU. The mean value ranges from 3.38 to 4.20 and standard deviation ranges from 0.94 and 1.22, which reflect that a majority of the respondents want to be benefitted from e-learning services offered by AIOU. The mean values of common information/FAQ, electronic information and interaction with teacher via internet are comparatively higher, favouring the idea that most students strongly prefer information via online modes.

Table 7: E-learning Preferences

<table>
<thead>
<tr>
<th>I would like the following online services from AIOU</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher interactions,(Tutorial/QA sessions etc.) using Internet</td>
<td>4.20</td>
<td>0.92</td>
</tr>
<tr>
<td>Well-structured content developed in simple English</td>
<td>4.10</td>
<td>1.05</td>
</tr>
<tr>
<td>Common information and FAQ</td>
<td>4.04</td>
<td>0.94</td>
</tr>
<tr>
<td>Electronic materials/instructions manuals etc.</td>
<td>4.00</td>
<td>0.90</td>
</tr>
<tr>
<td>Electronic content that match my style of learning</td>
<td>4.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Allow my own pace during available electricity hours</td>
<td>3.92</td>
<td>0.98</td>
</tr>
<tr>
<td>Individual attention</td>
<td>3.90</td>
<td>0.98</td>
</tr>
<tr>
<td>Teacher interactions using Radio/TV/Video Conference</td>
<td>3.38</td>
<td>1.20</td>
</tr>
<tr>
<td>Online problem solving by the university using Internet</td>
<td>3.87</td>
<td>1.22</td>
</tr>
<tr>
<td>Assignment/Course outline download</td>
<td>3.84</td>
<td>1.07</td>
</tr>
<tr>
<td>Online assessment by the teacher/tutor using internet</td>
<td>3.67</td>
<td>1.19</td>
</tr>
<tr>
<td>Teacher interactions using telephone</td>
<td>3.46</td>
<td>1.15</td>
</tr>
</tbody>
</table>
The online problem solving by the university indicates a mean value of 3.87, highlighting that the students wish to have a strong online support and complaint management systems. On the contrary, questions about the interaction via Radio/TV/Video Conferencing received the lowest mean value. It explains the fact that the lectures through audio visual aids, radio and TV are one-sided and lack active students’ participation and discussions. Interaction via telephone received a higher preference than Radio/TV that shows the strong possibility of Mobile Learning as a potential future method of delivery.

The analysis of the results further reveals that the respondents have referred individual attention as better option for their learning skills. The majority of learners want the contents that match their learning styles and may comprise of different format of contents (e.g. Text, Multimedia, Radio, TV, Mobile, Internet etc.). They want well-structured contents developed in simple English that they can learn at their own pace especially during available electricity hours. The mean values and standard deviation have shown significant preferences of students towards adaptable e-learning.

Keeping in view the review of literature and survey results, a generalized e-learning model is proposed which can be replicated in other environments as shown in figure 3. The model which is based on adaptivity in e-learning (Ahmed and Sangi, 2017) is comprised of content model, student model, online pedagogy and communication interface. The content model manages the media objects of varying types and format that match with the learning styles of students. The student model keeps the track of student portfolios, actions and preferences. The online pedagogy aligns the learning objects as per needs of students and deliver the contents using the communication interface. The proposed model has been pilot tested on selected courses being offered by AIOU for computer science students and the model has been successful in enhancing the opportunities of learning for students in an ODL environment. Furthermore, the knowledge level of those students using the adaptive model was also better than students using traditional way of learning as depicted by the examination results.

![Proposed Model of E-learning](image)

Figure 3: Proposed Model of E-learning

5. Conclusion

Technology is an important feature of e-learning in an ODL environment in order to support instructional strategies that use online pedagogical methods. However, the amalgam of many factors has posed many challenges for implementation of e-learning, especially in developing countries. This paper has investigated the general problems and perceptions of e-learning in developing countries. The case of Pakistan has been presented with more specific issues and challenges of e-learning. The paper has also elaborated the status of e-learning in distance education institutes of the country. Further, influencing factors in Pakistan in terms of ICT growth, Internet broadband subscribers and cost of internet and 3G & 4G technologies have been presented. A survey was conducted with local students in order to determine their views about challenges and priorities in terms of e-learning. The survey results showed that main issues of e-learning are electricity shortfall, English language competency, non-availability of specialized contents and dependency on teacher. The results established the finding of existing studies about the challenges of e-learning in Pakistan; however, the ICT infrastructure and Internet bandwidth were found as the emerging opportunities as highlighted by the
ICT growth parameters and also confirmed by the survey respondents. These opportunities have resulted in high preferences of e-learning by the local students.

E-learning has a great potential in Pakistan if challenges are addressed timely and effectively. The preferences of local students are high and they are eager to adopt the modern means of distance education within the available technology infrastructure. There is a great need of a generalized e-learning model for developing countries especially Pakistan which may comply with both national and international e-learning standards. The model may comprise of content model, student model, online pedagogy and communication interface. The existing local ICT infrastructure may be optimized through the provision of alternate teaching strategies during power failure with a self-learning mode. Similarly, the English competency issues may be addressed by developing adaptable contents in simple English. The learning needs of students may be addressed by defining sequence and depth in learning contents matching with the course learning outcomes. The learning contents may be enriched by giving examples from local contexts. The pedagogy of the said program may be redefined with open and closed ended activities with a consistent approach so that learners may participate in online activities with ease. Finally, a user-friendly interface may be developed to facilitate the content presentation and navigation control in easy steps. This generalized e-learning model may help the learner to acquire knowledge with concentration.

Acknowledgement

This research work was conducted through the guidance and support from our colleagues (faculty & staff) and students of AIOU. We are also thankful to internal and external reviewers, who spare their precious time to review this paper.

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Editorial for EJEL Volume 16 Issue 2

In this issue we get an interesting view into the global scale at which empirical research at EJEL is carried out. We are literally all over the world, and the research demonstrates the breadth of the e-Learning concept.

Among others, we visit two blended learning settings. First, in a case study from the Department of Computer and Systems Sciences, Stockholm University, in Sweden, Thashmee Karunaratne investigated blended learning formats during students’ thesis work at both the bachelor and master level. Her study entails working with five identified phases. The results point to the premise that through the use of an ICT system, the administration (as, for example, the automatic matching of students to supervisors, and collecting the student projects and materials) is made easier, the supervision activities run better (as in scheduling meetings) and collaboration is of a better quality; not only in student/teacher relations, but also through peer feedback and review tools.

Similarly, Adriana Huertas-Bustos, Omar López-Vargas and Luis Sanabria-Rodríguez report on a blended learning course in chemistry, from Bogotá D.C., in Colombia. In the paper “Effect of a Metacognitive Scaffolding on Information Web Search”, their intention is to research and improve students’ internet searches. The paper commences with an investigation into the concepts of metacognition and scaffolding, which leads up to describing the context of an experimental design-inspired process, with three different setups. The three setups involved three groups of students interacting with the blended learning process, applying fixed, voluntary and non-scaffolding processes. The results showed improvements when working with scaffolding, but slightly different from what was anticipated, which is discussed thoroughly in the paper.

The third paper is situated within teacher education, and is written by Zuzana Straková and Ivana Cimermanová, from Slovakia. The paper investigates the reflective practices of student teachers, when teaching as part of their teacher training. A design was implemented that moved reflection from taking part immediately after students had taught part of a lesson, to an online environment, where the idea is that time is given for self and peer reflection on critical instances of the teaching situation, as well as to move beyond mirroring the trainers input. The results, which rest on a two-semester investigation, are discussed and point to the result that the e-Learning “provided the opportunity to focus the reflection and critical thinking of student teachers, not only in the behavioural domain but also in cognitive and emotional domains.”

From South Africa, Gail Drennan and Ian Moll, in the paper “A Conceptual Understanding of how Educational Technology Coaches help Teachers Integrate iPad Affordances into their Teaching” claim that iPads technological affordances can lead to the development of new pedagogical affordances. The authors review affordance literature and then argue for conceptual links between the iPads technological capabilities, which create technological affordances leading to pedagogical affordances. They have conducted interviews with five educational technology coaches and the five teachers they were coaching. From the literature and the empirical data, six ways are developed in which iPad technological affordances can create new pedagogical affordances, and change pedagogy, and the paper concludes that teachers can change their pedagogy through using these six relationships.

Resarching a military education in the Philippines, Christopher Chua and Joseph Archog report on the use of a LMS on a Squadron Officer Course, in Moodle. Here, 47 officers’ satisfaction with the course were investigated, where satisfaction in terms of learner interface, learning community, content and usefulness were surveyed through a questionnaire. The intention was to provide input to the design and implementation of this and other military environments, which is the reason for also investigating whether the satisfaction varied across profile variables. The results are that the officers are satisfied, without much variation across profiles, and the paper concludes that this also points to the timeliness, and that military education can officially integrate such technologies into the officer training.

Finally, this issue ends with a paper from Pakistan, on “Factors Influencing the Adoption of e-Learning in an Open and Distance Learning Institution of Pakistan”, authored by Moiz Uddin Ahmed, Shahid Hussain and Shahid Farid. The paper provides a rich country specific overview of the major institutes offering e-learning and distance education, the challenges of e-learning and the influencing factors for the adoption of e-learning in Pakistan. It then surveys selected students in two programs within Computer Science, with 250 answered
questionnaires, which finds strong preferences for e-Learning activities, but also identifies challenges, ranging from electricity shortfall to lack of specialized content.

Journal Editors
Rikke Ørngreen and Heinrich Söbbe