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Research and innovation in teaching and learning are prime topics for the *Journal of Instructional Technology and Distance Learning* (ISSN 1550-6908). The Journal was initiated in January 2004 to facilitate communication and collaboration among researchers, innovators, practitioners, and administrators of education and training involving innovative technologies and/or distance learning.

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International Journal of Instructional Technology and Distance Learning

Editorial

Innovation Donald G. Perrin

In teaching and learning, innovation is often a positive force to increase productivity. Innovations in information communication technologies present opportunities to improve teaching and learning. Innovation implies something new and useful. Its impact may be slow and incremental or it may be revolutionary. Invention is an *idea* made manifest. Innovation occurs when *ideas are applied successfully* in practice. (Wikipedia, Innovation)

Lack of a key ingredient can be a barrier to innovation. For example, inventors tried for more than half a century to invent motion pictures. They combined photography and a variety of tools to photograph and display successive images. George Eastman introduced photographic materials on a celluloid base in 1889, and within four months the motion picture as we know it was invented in several nations. The most successful were Pathe 9.5mm in France and Edison with 35mm sprocketed film in the USA. Projection required a further invention from Lumiere in France.

19th century technologies to advance education included the chalkboard, slate, lantern slide and phonograph. Projection devices using film and filmstrips came early in the 20th century. World War II stimulated research and widespread use of audiovisual to rapidly train millions of troops. These developments were a major asset to public education after World War II.

The advent of broadcast television, audiotape, and later videotape recorder-players, gave education language laboratories and Instructional Television Fixed Service (ITFS) in the 1950s. Many innovations were transitory: television broadcast from an airplane to serve schools in several states (Midwest Program for Airborne Television Instruction - MPATI) was quickly replaced by less costly ground based systems.

Sputnik was a wakeup call for American education, especially for science, math, and engineering. It stimulated a surge of innovations in curriculum, pedagogy, teacher training, and research, especially research in learning and communication, funded by the National Defense and Education act, the Vocational Education Act, Ford Foundation, Carnegie Foundation, and many others.

Until the invention of the Language Laboratory in the mid-1950s, educational technologies were primarily for one-way communication to reach increasingly larger audiences. The early sixties saw the invention of teaching machines and programmed instruction, computer assisted instruction, and a variety of technologies for individualized instruction. When federal funding ended, traditional pedagogies returned. Most technology-based programs could not be sustained on school budgets.

There was a resurgence of innovation with the advent of personal computers in the early 1980s and the WorldWideWeb (Internet) in the 1990s. Governments and school administers recognized the potential of computers and Internet for preparation, storage and distribution of educational materials for learning, teaching and research. There was a resurgence of funding to ensure that every school had computers and internet connections. However, like many previously funded efforts, mechanisms were not put in place to keep equipment, networks, software, and courseware maintained and up-to-date. As a result, the potential of these innovations has yet to be realized in many public schools and will continue to be a "work in progress" for higher education.

International Journal of Instructional Technology and Distance Learning

Editor's Note: This study involves the use of digital video and digital storytelling as a means of documenting early field experiences in a teacher education program.

The use of digital storytelling to promote reflective practice in teacher education Carmen Peña and Isela Almaguer

USA

Abstract

During the fall 2011 semester, a group of students in their first semester of the elementary education program at the University of Texas – Pan American was required to participate in 32 hours of field observation. Students created a movie using PhotoStory to document their field observation experiences. Students were required to take pictures and keep a journal to reflect on the following dimensions of the classroom environment: 1) school climate, 2) mentor teacher 3) physical layout of classroom, 4) instructional strategies, 5) classroom management, 6) students, and 7) personal reflections. The journal entries served as the script for the movie which students narrated and combined with photographs and music to create a movie. The movies were then analyzed using The Kelley-Robinson Coding Rubric for Reflective Thought (Robinson & Kelley, 2007) to categorize the depth of reflection evident in the movies. Data indicated that the majority of participants reached the third level of reflective thought, a description of what was observed, when discussing the teacher, layout of the classroom, and classroom management strategies used.

Keywords: Teacher education, digital storytelling, reflective practice, field observation, reflective journaling, PhotoStory, Kelley-Robinson Coding Rubric, field experience, critical reflection, elementary education, instructional technology, educational technology, digital video

Introduction

A long-standing issue in teacher education is the dichotomy that exists between theory and practice wherein students learn theory in the university classroom and learn practice in the actual school setting through field observation. Indeed there is data from the National Center for Educational Statistics indicating that many graduates of schools of education believe that traditional teacher preparation programs do not adequately prepare them for the challenges and rigors of the classroom (Davis & Moely, 2007). Even though most teacher education programs are field based and students are able to observe the real world of the classroom through field observation and then teach under the guidance of a mentor teacher they still feel unprepared for the realities of the actual classroom (Davis & Moely, 2007). Theoretical knowledge is often presented in the classroom in an abstract, decontextualized manner. Consequently, students have a difficult time drawing on their knowledge of theory while teaching (Korthagen & Kessels, 1999). In the complex world of the school setting teachers need to be able to make quick decisions in response to a wide range of pressing problems (Hewitt, Pedretti, Bencze, Vaillancourt, & Yoon, 2003). Teachers rarely have the luxury of time for the careful deliberation of educational principles and theories. Decisions are based largely upon immediate personal perceptions and are based on the emotions, needs, values, habit, and the constraints of the situation (Korthagen & Kessels, 1999). Despite the efforts of most teacher education programs to provide a balanced program that incorporates both theory and practice, many students have a difficult time bridging the theory in the university classroom to the real-world setting of the school (Davis & Moely, 2007). Although students are able to observe an actual classroom with all of its authenticity and richness as part of their education in a field-based program, there is no guarantee that students will connect what they observed in the elementary classroom to the theories they read in textbooks and learn in class

(Anderson & Freebody, 2012). To connect the complex nature of the school setting to theory students need opportunities to reflect deeply upon the activities that occur within the school setting and their reactions to them (Schön, 1987).

One of the tenets of teacher education is reflective practice and is based on the assumption that teacher education students gain information about their teaching through self-observation and critical reflection (Zeichner & Liston, 1996). Through critical reflection, students develop context specific theories that further their own understanding of their work and generate knowledge to inform future practice. One method for fostering critical reflection is reflective journaling (Hatton & Smith, 1995; Lee, 2010). To be effective, reflective journaling needs to describe the events or activities that occurred in the classroom, what changes could be made and how to improve the lesson (Lee, 2010). Reflective journaling is a key component for becoming a skillful reflective practitioner.

Although many teacher educators have used reflective journaling to help students gain full advantage of their field observations (Hatton & Smith, 1995; Lee, 2010), one limitation of this technique, however, is that it does not capture the full scope of the classroom and all of its richness and nuances (Stetter, 2011). Digital storytelling, in contrast allows individuals to capture and describe experiences, or tell stories, in a more robust manner through photographs, graphics, text, music, and recorded audio. One type of digital story is the personal narrative (Robin, 2008) in which the author tells of a personal experience or a significant event in his or her life. For students in teacher education, field observation is a significant event because it is one of the rare times students will be able to visit a teacher's classroom simply to observe and to learn. Students are well aware that at no other time in their career will they be able to walk into a teachers' classroom just to observe.

Given the significance of early field observations, the importance of reflective practice and the ability to relate the events that occur in the elementary classroom to theoretical knowledge being gained in the college classroom, it seems that digital storytelling is an excellent medium for documenting one's field observation. The use of digital storytelling has many advantages. The integration of text and visual images has been found to improve student comprehension (Burmark, 2004) and the process of creating a digital story enhances communication skills as students learn to collect information, ask questions, develop an organized script, express opinions and construct meaningful narratives (Burmark, 2004). In addition other researchers have also found that digital storytelling enhances learning motivation, learning achievement, and problem solving ability (Hung, Hwang, & Huang, 2011)

Although digital storytelling has been used extensively in the elementary classroom to help students develop their literacy and technology skills to create products that are authentic and meaningful, it has not been used as extensively in teacher education programs to help students document and reflect on their field experiences. Thus, the purpose of this study was to have students create a movie based on their field observations and assess the depth of critical reflection using the Kelley-Robinson Coding Rubric for Reflective Thought (Robinson & Kelley, 2007).

Method

Subjects

In the fall 2011 semester, 61 students enrolled in Block I of the elementary education program at The University of Texas – Pan American participated in 32 hours of field observation. In terms of gender 97% of the students were female and 3% were male. With regard to ethnicity 99% of the students were Mexican American and 1% was White.

Instruments

The two instruments used in this study were the field observation movie assignment and the Kelley-Robinson Coding Rubric.

In terms of the assignment, students were instructed to keep a journal of their classroom observations and were told that this would later serve as the script to the movie or digital story they were creating. Students were required to reflect on one of the following seven dimensions of the school classroom:

School climate Mentor teacher Classroom layout Lesson observation Classroom management Students

Final overall reflection

In terms of school climate, students reflected on the feelings they had upon walking into the school for the first time and to consider the atmosphere. Was it warm, relaxed, and happy or cold, tense, and uninviting? Students reflected not only on the school atmosphere but why the school had a particular atmosphere. Was the leadership strong and supportive, which led to happy teachers or was it unsupportive and demanding, leading to frustrated and anxious teachers?

For the second dimension, mentor teacher, students were required to interview their mentor teacher to find out how long their mentor had been teaching, his or her reasons for becoming a teacher, the most rewarding aspect of teaching, the most challenging aspect of teaching and advice for new teachers.

To observe classroom layout and its effects on learning for the third dimension, students took a picture of the mentor teachers empty classroom and commented on the organization and layout of the classroom and whether it was conducive to learning or not.

With regard to the fourth dimension, instructional strategies, students were asked to analyze one lesson in terms of Gagne's Nine Events of Instruction. Students analyzed one lesson and determined how the teacher gained the students attention, evoked prior knowledge, informed learners of the objective, presented information, provided learning guidance, etc.

In addition to describing and analyzing a lesson, students were also required to reflect on the classroom management system and observe classroom routines, classroom rules, methods used to address disruptive behavior, assess the effectiveness of the classroom management system, and areas for improvement.

Apart from observing the teaching environment and the teacher, students also had to reflect on the students and discuss academic performance in general, behavior, the most challenging moments, most rewarding moments, and the most memorable student.

Finally, students were asked to reflect on the effect their field observation experience had on their growth as a teacher. They were asked to discuss personal frustrations, insights, proudest accomplishments, areas in which they had grown and which areas they need to improve.

The second instrument used in this study is The Kelley-Robinson Coding Rubric for Reflective Thought (Robinson & Kelley, 2007) for assessing depth of critical reflection. The instrument

consists of eight levels of reflective thought which each increase in complexity: 0) a goal statement with no reflection; 1) a statement of fact that is not reflective in nature; 2) a description of the event that occurred with no reflection; 3) a description of an observed event with the use of correct terminology; 4) a description of an observed event from one's personal perspective, using correct terminology that considers the impact on others; 5) a description of an observed event using correct terminology and told from multiple perspectives; 6) a description of an event that explores reasons for actions and is observed from a distance; and 7) a consideration of the holistic picture and implications for future actions.

Procedure

The pre-service teachers in this study were required to attend six 8-hour days of field observation. Students were required to focus on one of the seven aspects of the school setting for each day of field observation and record observations in a journal and collect pictures to illustrate that particular aspect. The journals that students kept later became the script for their digital story. Toward the end of field observations, students were taught to use PhotoStory; following the tutorial they created their own movies using their script, photographs, and stock images. Student movies were analyzed to assess level of reflective thought.

Results

Data indicated that the majority of participants reached the third level of reflective thought, a description of what was observed, when discussing the teacher, layout of the classroom, and classroom management strategies used. Table 1 indicates the percentages of participants who reached a particular level of reflection.

Rating	Level	School %	Teacher %	Layout %	Lesson %	Mgt. %	Students %	Final Thoughts
								70
0	Goal Statements	0	0	0	0	0	0	0
1	Statements of Fact or Skill	2	0	0	16	2	10	7
2	Descriptive writing of what was observed	8	90	64	28	77	16	3
3	Observed event with terminology	0	0	0	0	0	0	0
4	Observed event with terminology and personal perspective	89	8	26	26	20	64	89
5	Observed event with terminology and multiple perspectives	2	2	10	28	2	8	2
6	Discourse with self and explores possible reasons for actions	0	0	0	2	0	2	0
7	Considers holistic picture and implications for action	0	0	0	0	0	0	0

Table 1 Percentage of ratings for all reflections

The lack of depth in reflection regarding the layout of the classroom and the teacher may have been because of the prescriptive nature of the prompts which may not have allowed for further analysis that would have possibly resulted in more depth in reflection. Additionally, students in the first block of the teacher education program had not covered more aspects of functional and developmentally appropriate classroom layouts. This information would be covered in subsequent blocks; thus, it may have prevented the students from reflecting more deeply on the aspects of the classroom layout and its effects on student learning. Further, observing the layout of the classroom and considering its implications for instruction, 64% of participants only reached level 2 and simply provided a description of what was observed. However, 26% not only provided a description of the classroom layout, they did so from a personal perspective.

For the mentor teacher interview, participants were given a set of questions to ask their mentor teacher and it may have been that the questions did not leave any room for interpretation so participants simply "collected data." The questions were close-ended and required only a short 'yes' or 'no' answer without need for additional analysis for the interviewer, the student, or the interviewee, the teacher.

When considering the classroom management strategies used participants were encouraged to consider the implications of the strategies used on the behavior of the students; however most participants only reached a level 2. The lack of depth regarding classroom management observations may have been due to the participants' lack of knowledge regarding classroom management, which is taught in classroom management, in the third block of courses. Students may not have been able to analyze in depth the appropriateness of the management system used by the teacher if they had not covered this in their courses thus far.

When discussing the school, elementary students, and final thoughts on the experience results indicated that the majority of participants reached the fourth level of reflection, which is observation of the event with the use of appropriate terminology and a personal perspective (see Table 1). When asked to reflect upon a specific lesson, participants were fairly evenly distributed across the third (description of event), fourth (descriptive of event with use of correct terminology from one's own perspective, and fifth (observation of event from multiple perspectives) levels of reflection with nearly a third of participants at each level. The fact that the reflection on a specific lesson yielded the most variability in responses may have been a result of the complex nature of the lesson observation, the number of events participants were asked to observe, and the broad scope of the lesson observation. When discussing the school environment and final thoughts 89% of the participants attained the fourth level of reflective thought, a description of events with correct terminology told from a personal perspective (see Table 1). Prompts for consideration of both aspects of the classroom encouraged participants to consider how the school climate made them feel and their own personal thoughts on field experience as a whole. Simply prompting participants to consider an attribute from a personal perspective may have led them to reach level 4. Finally, 64% of participants achieved level 4 when considering the students in the classroom (see Table 1). Once again, the prompt for consideration of the elementary students encouraged participants to reflect this aspect of the classroom from their own personal perspective.

A bar graph showing the percentage of participants that attained a specific level of reflective thought is shown in Figure 1.





Table 2 shows the descriptive statistics for all levels of reflection across the seven dimensions of the classroom.

Descriptive Statistics for Ratings for All Reflections							
	School	Mentor Teacher	Classroom	Instructional Strategies	Classroom Management	Students	Personal Reflection
Mean Rating	3.90	3.11	3.46	3.70	3.21	3.75	3.85
Std. Dev.	0.40	0.37	0.67	1.10	0.49	0.81	0.54
Mode	4	3	3	5	3	4	4
Max	5	5	5	6	5	6	5
Min	2	3	3	2	2	2	2
N	61	61	61	61	61	61	61

Table 2Descriptive statistics

As Table 2 indicates, the mean level of reflective thought was greater than 3 indicating that for all seven dimensions the majority of participants were able to not only describe events that occurred, but do so from a personal perspective and use the correct terminology. The most frequently occurring level of reflection was between a three and a four for most of the seven dimensions with the exception of the lesson observation wherein the most frequently occurring level of reflection was a five.

Recommendations

The results of the study were encouraging in that data showed that most participants were able to reach a certain level of reflective thought for all observations. However, most of the participants did not reach the higher levels of reflection. Several recommendations can be made for future research. First, it may be beneficial to share the scoring rubric with students prior to the start of the field observations. Simply, letting students know what is considered critical reflection may help them to reflect on issues in field observation more deeply. Second, students should be explicitly encouraged to consider all aspects of the classroom from multiple perspectives. For example, classroom management should be considered not only from the perspective of the teacher but the students as well. As such, are some of the techniques used potentially humiliating for students such as isolating a student from others or do they encourage moral development in students. Third, prior to assigning the field observation movie project, the students were provided with an example of a finished movie. Several students indicated that they found the examples quite helpful. Finally, students were told at the beginning of field observation that their field-based reflections would become the script for their movie. Many students reported anecdotally that knowing this in advance helped them to include sufficient detail in their notes. Although there are improvements that can be made in the use of digital storytelling to document field observation experiences it does appear that it is an effective way of helping students to be active participants in the process rather than passive observers.

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Editor's Note: An increasing range of information and communication technologies provide an array of opportunities and challenges for teaching and learning. Matching learner's needs with pedagogy and technology is a work in progress. This paper explores the options and their level of adoption.

Researching English teachers' ICT use and its impact on students' English learning performance

Ardi Marwan Indonesia

Abstract

This study examines English teachers' use of Information and Communication Technologies (ICT) and its impact on students' English learning. To achieve the general aim of this research, a mixedmethod research design approach, with questionnaire, semi-structured interview, and document analysis, was incorporated. Around 160 students representing eight departments from one higher vocational institution in Indonesia were invited to be the research participants. Firstly, the participants were requested to fill in the questionnaire aiming to get some general ideas about ICT applications used by their English teachers and their frequency of use. Then, interviews were performed with some of the participants in order to elaborate upon some of the ideas concerning the quality of English teachers' ICT integration. Some documents associated with ICT integration for English teaching and learning were also examined. The findings of this study revealed that a number of applications, especially the ones considered to be old-fashioned (e.g. PowerPoint presentation) were used quite frequently while others (more modern ones such as social media and video streaming) were used infrequently. This study also observed some positive uses of ICT by the English teachers as expressed by a number of students during the interviews.

Keywords: English, teaching, learning, Information and Communication Technologies (ICT).

Introduction

Today's teaching and learning approaches have been altered so much from those of the past (e.g. two decades ago), particularly since technological advancements, such as computers and the Internet, have been an important part of modern education. Many teachers, including those who teach English, are now integrating these fast changing teaching aids in their classrooms in an expectation that better learning atmospheres, where the focus of teaching is on learners or learner-centered classroom, can be created (Abdo & Semela, 2010; Rakes, Fields, & Cox, 2006; Wozney, Venkatesh, & Abrami, 2006).

Information and Communication Technology (ICT) is a term very closely linked to computer related technologies (Marwan & Sweeney, 2010). Researchers (e.g.,Baylor & Ritchie, 2002; Cradler, McNabb, Freeman, & Burchett, 2002; Marwan & Sweeney, 2010) have revealed that the use of ICTs, such as computer and internet can make a significant difference in teaching and learning. Abdo and Semala (2010, p. 78) citing Baylor and Ritchie (2002), for example, explain that "teachers' use of instructional media or ICT can sustain students' attention, increase the meaningfulness of abstract concepts, encourage deep processing, and boost class performance through increased content acquisition". Sharing a similar thought, Cradler, et al.,(2002, p. 47) argues that technological tools used by teachers, can enhance learners' ability to develop their "higher order thinking and problem-solving skills (e.g., information research, comparing and contrasting, synthesizing, analyzing, and evaluating)." This is possible because these tools provide various applications in which their use can be adjusted to suit the need and level of the learners.

Research studies looking at teachers' use of ICT as well as the impact of media use on learning, are not few in number (see, for example, Abdo & Semela, 2010; Baylor & Ritchie, 2002; Marwan & Sweeney, 2010; Rakes, et al., 2006) and many of which are able to highlight some groundbreaking findings, of which some or all are used as the basis for policy formulation. But, studies addressing a similar issue undertaken within the context of ICT use for English language teaching and learning in vocational education in Indonesia are still not many. Thus, there is not much to say about how ICT has been incorporated in English teaching and learning and whether or not its use can significantly impact English learning performance in this particular context. In other words, the under representation of such information has brought about a gap in the literature and accordingly, more studies within this area are a necessity.

Research questions

This study seeks to address the following research questions:

- What types of ICT applications are frequently or infrequently used by English teachers in their teaching?
- How well do teachers integrate ICT in their English classrooms?
- What are the impacts of English teachers' ICT use on students' English learning performance?
- Are applications based on a theoretical framework
- What Information should English teachers know about ICT integration

Whether or not the use of ICT can influence learning has become a debate in the ICT literature for more than a decade. Researchers, including Clark (1994), maintain that media like ICT may "have differential economic benefits but no learning benefits" (p. 21). Newhouse (2002) is not in total agreement with Clark (who seems to be so pessimistic with the presence of ICT in a teaching and learning environment). He confirms that the presence of ICT is still a necessity but is not supportive with the idea claiming that ICT has a direct influence on learning. According to him, ICT is "only one element" which influences learning environment and accordingly, it is not wise to "entirely remove the effects of other elements of the learning environment" (p. 16). In other words, ICT is not the determinant factor for the realization of a successful learning environment.

The presence of ICT is of course important and considered to be a must-available facility in the current information age, but what is most important is that teachers should possess a sense of pedagogical innovations, in order to integrate ICT effectively in their teaching (Lim & Chai, 2008; Wong, Li, Choi, & Lee, 2008). Wong, et al.,(2008) view pedagogical innovations as:

Emerging practices that involve changes in what teachers and students do and learn in the classroom, which prepare students for lifelong learning in the information society. Examples of such practices can be activities that promote active and independent learning in which students take responsibility for their own learning, and activities engaging students in collaborative learning in which students work with others on complex, extended, real-world-like problems. (p. 250).

Lim and Chai(2008) have also made this case very clear that it is teachers' pedagogical skills or innovations which make their ICT integration a successful one, and not the newness of ICT facility used in teaching and learning. These pedagogical competencies then determine differences in teachers' use of ICT for enhancing teaching and learning and consequently, different teachers may adopt ICT differently. This also means that "in examining technology implementation it is necessary to examine the range of teachers' instructional applications of technology" (Wozney, et al., 2006, p. 175). This is important to be done, because teachers need to be convinced if their use

of ICT can add value to students' learning. Lim and Hang (2003) remind teachers that ICT is just a tool for teaching and learning and if they are not properly integrated, the main objective of teaching and learning (i.e. to enable the process of knowledge construction) will not be achieved. So, again, teachers' pedagogical competencies and innovation are being tested when ICT facilities are surrounding them.

Despite being considered the most important component or factor in the process of ICT integration (Way&Webb, 2006), teachers' pedagogical innovations, as viewed by some ICT for education researchers (e.g. Tearle, 2004), will not work well in the absence of many other influential factors. Thus, ICT integration is complex and its process has to be viewed holistically (Marwan & Sweeney, 2010). Components of ICT integration, other than pedagogical innovations that are well grounded in computing literature, include stakeholders' attitude towards ICT, technical knowledge, professional development, leadership, beliefs in ICT, motivation, ownership, strategic management, resources, organizational culture, and external influences (see, Marwan & Sweeney, 2010; Tearle, 2004; Wozney, et al., 2006). This phenomenon implies that a complete success of ICT integration is very difficult to achieve. In other words, problems and challenges will always be present whenever people address and investigate the integration process of this always changing technology. What research should be providing is a path that can be followed by those involved in the process of ICT integration so that learners, as the target audience, can take the most benefits from it.

Realizing the complexity of ICT processes, it is, therefore, not the aim of this current research to justify the success or failure of ICT integration. But, it will examine the quality of teachers' use of ICT in their English teaching and the impact of their use on students' English learning. It can also be said that it is in the interest of this research to reveal teachers' pedagogical innovations when using ICT in their teaching.

Impacts of ICT on students' learning environment

The change of learning environment, from less positive (or negative) to more positive, has been the main target of ICT use. But again, this may only happen if part or all of the influencing factors contribute well in the change process (see Marwan & Sweeney, 2010; Tearle, 2004).

Newhouse (2002), who performed a thorough literature review touching on the issue of ICT integration, recorded a number of impacts of ICT on learning environment. These impacts and the examples of relevant activities (written by various authors and cited by Newhouse) are described in Table 1:

Impacts of ICT on learning				
Positive Impact of ICT	Examples of ICT supported activities			
Investigate reality and build knowledge	Teachers can bring the real world or factual activities into the classroom (Riel, 1998);			
Promote active learning	"The use of online systems to support active learning through providing forums for feedback and reflection have been shown to promote greater depth of explanations by students of varying ability" (Committee on Developments in the Science of Learning), 2000 in Newhouse, 2002,p.20);			
Engage students by motivation and challenge	ICT does provide "opportunity to create a wide range of interesting learning experiences" (Committee on Developments in the Science of Learning, 2000, in Newhouse, 2002, p.21).			

	Т	able	e 1		
mpacts	of	ICT	on	learning	

Positive Impact of ICT	Examples of ICT supported activities
	"The interactive and multimedia features within software can be used to help students grapple with concepts and ideas" (Committee on Developments in Science of Learning, 2000, (Newhouse, 2002 p.21).
Provide tools to increase student productivity	"Many computer applications provide the tools to support students in quickly completing their tasks" (p. 21).
Provide scaffolding to support higher level thinking	ICT allows teachers to consider providing a range of activities to assist students to become critical thinkers, designers and problem solvers (Committee on Developments in the Science of Learning, 2000).
Increase learner Independence	Teachers may provide students with access to software allowing students to select different learning experiences and the class does not have to be treated as one group;
Increase collaboration and Cooperation	"The use of ICT leads to more cooperation among learners within and beyond school and a more interactive relationship between students and teachers" (Réginald Grégoire inc. et al., 1996 in Newhouse, 2002, p.22).
Tailor learning to the Learner	ICT allows "the student and/or teacher to tailor the learning experience to suit the individual student" (Cradler & Bridgforth, 2002 in Newhouse, 2002, p.22).

Cited from Newhouse (2002)

Research methods

Design of this study

A mixed-method approach was incorporated in this research. Firstly, quantitative research was used to collect information from a quite large number of participants. By doing this, a generalization of conclusion based on the analysis of quantitative data could be made. Then, the qualitative part of this research, secondly, seek more qualitative information from the participation in an expectation that more comprehensive findings or conclusions related to English teachers' use of ICT and its impacts on students' English learning could be generated.

Setting and participants

All the processes of data collection of this research took place at a vocational higher institution in Indonesia. Students representing all departments in the institution were involved. Around 20 students from each department were randomly selected and some of which were purposively sampled for further investigation. Prior to approaching the participants, permissions were sought from the head of each department. The heads were also informed that the involvement of participants in this study would not affect the process of teaching and learning processes as the data collection activities would be performed outside the teaching hours. Overall, there were 160 students involved in this study.

Instruments for collecting data

This study incorporated three instruments for data collection. Firstly, a questionnaire was used. Some of the items in the questionnaire were adopted from ICT usage questionnaire developed by Gulbahar and Guven(2008). The use of this questionnaire was to gather general information about the types of ICT applications used by English teachers in their English teaching and learning activities. English teachers' frequency of use was also measured using this tool.

No	No ICT Applications		How often are these applications used by your English teachers?					
		Always	Often	Sometimes	Rarely	Never		
1	Word processors (Word etc.)							
2	Spreadsheets (Excel etc.)							
3	Presentation software (PowerPoint etc.)							
4	Databases (Access etc.)							
5	Web page development tools (FrontPage, Dreamweaver etc.)							
6	Web browsers (Netscape, Explorer etc.)							
7	Search engines (Google, Yahoo etc.)							
8	Electronic mail (email)							
9	Social media (Facebook, Twitter, etc.)							
10	Instructional films (video, CD, VCD, etc.)							
11	E-learning							
12	Video streaming (YouTube, etc)							
13	Other applications (please write here):							

The questionnaire

Partly adapted from Gulbahar & Guven(2008)

Secondly, a semi-structured interview was used as the second data collection tool in this research. Several students were questioned about how their English teachers integrate ICT in teaching. Some questions, would lead to the collection of information about the quality teachers' ICT use and its impact on students' English learning performance, and they were developed and used as a guide in the conduct of interviews. Finally, document analysis was used as a third type of data collection instrument. Documents including materials provided by teachers to students for their learning were observed to examine the process of ICT integration in English teaching and learning.

Strategies for analyzing data

First, data from the questionnaire were statistically calculated using SPSS. In this process, the frequencies of English teachers' use of ICT were analyzed. Then, a general conclusion about the types of ICT applications and their frequency of use was made upon completing the analysis of quantitative data. Secondly, qualitative data analysis involved the process of data reduction, selection and simplification. During these processes, NVIVO software was used to identify categories and themes that were based in data. These themes were then used as headings in the data reporting process supported with some narratives from the research participants.

Results

This research collected data from students currently undergoing English lessons in various departments in a vocational higher institution in Indonesia. The findings of this study are displayed below.

ICT applications used for teaching and learning English

In this section of the analysis, two types of frequency terms are used. That is, the percentage of 'always' and 'often' responses are summed up to show that a certain application is used (more)

frequently in the process of teaching and learning and then, the percentage of 'sometimes', 'rarely' and 'never' is added up to refer to the infrequent use of an ICT application.

Word processors

As can be seen in the data, word processors (e.g. MS Word) are most frequently used by English teachers teaching in the departments of accounting (87%), mechanical engineering (80%), and fishery (61.9%). These percentages indicate that this type of application is highly considered in these particular departments for enhancing the teaching and learning of English. A rather contrasting phenomenon, however, is seen in the departments of architecture (30%), electrical engineering (30%) and business administration (37.9%) indicating the infrequency of Word processors use. Then, in the two other departments (agriculture and civil engineering), this application is somewhat used quite frequently by their English teachers (52. 6% and 56.5% respectively).

Spreadsheets

Unlike the word processors, spreadsheets are only popular in the department of accounting. The students involved in this study noted that their English teachers in this department frequently used (95, 7%) this type of application for enhancing English teaching and learning. This figure could be so high because of the fact that spreadsheets are mostly used for undergoing financial calculation purposes, the kind of learning activity commonly performed in this field of study. Since, the focus of teaching English in this department is to help students understand accounting related terms and activities, the use of spreadsheets for facilitating teaching and learning is not an uncommon view.

No students from other departments claimed that their English teachers have incorporated spreadsheets in the process of English teaching and learning. This fact could also be an indication that this type of application is less applicable in areas other than accounting.

Presentation software

This application could be argued to be the most popular in English classrooms across all departments. Data from the questionnaire showed that nearly all English teachers from agriculture (94,7%) and business administration department (96,5%) used this type of application frequently in teaching and more than 2/3 of the teachers from the departments of fishery (76,2%), architecture (85%), mechanical engineering (80%) and electrical engineering (80%) became the frequent users of this application.

This study observed that this presentation software gained rather low frequency percentages only at two departments, namely accounting (65. 2%) and civil engineering (47.8%). Such percentages, however, could still be a positive indication that this software is still a popular one in these departments. In short, English teachers have become frequent users of presentation application in their English classrooms.

Databases

This computer application seems to be rarely used by English teachers across all departments. This study only observed English teachers from five departments (i.e. agriculture: 10.5%, business administration: 13.8%, civil engineering: 17%, architecture: 25%, and accounting: 8.7%) who, to some extent, incorporated this application into their English teaching activities. Overall, databases are not incorporated frequently by English teachers in this higher vocational institution.

Webpage development tools

Data from the questionnaire showed that this computer application is not a popular one among teachers of English in this vocational institution. Most students have not yet noticed if such an

application has been present in the English teaching and learning process. There were only a few who, to some extent, indicated that their English teachers have incorporated this application in their teaching and these students belong to the departments of agriculture (5.3%), fishery (23.8%) and architecture (35%).

Web browsers

This type of application, despite its still underuse by most departments, is beginning to gain popularity in this vocational institution. Data from the questionnaire indicated that students from the departments of agriculture, architecture, fishery, mechanical engineering and business administration have seen their English teachers become frequent users of this application and the percentages are 63.2%, 35%, 33.3%, 30% and 20.7% respectively.

This study only observed one department (i.e., electrical engineering) whose English teachers never used this type of application in English teaching and learning activities.

Search engines

Teachers of this vocational institution (except those based in the departments of electrical engineering: 0%, accounting: 13%, and civil engineering) seem to have begun to realize the importance of the use of search engines such as Google, Yahoo, etc. for supporting English teaching and learning. A quite significant number of students from various departments have witnessed the frequent usage of search engines in their English classrooms (agriculture: 52%, fishery: 66.7%, business administration: 48.3%, architecture: 55%, and mechanical engineering: 25%).

Electronic mails

Data of this study showed that there were irregularities of electronic mail usage by English teachers in this vocational institution. For example, students from departments of agriculture (73,7%) and business administration (55,2%) claimed that this type of application was frequently used for supporting English teaching and learning whereas others (e.g. civil engineering: 0%, architecture: 0%, accounting: 0% and electrical engineering: 0%) saw that their English teachers rarely or even never used it for English teaching and learning purposes. Then, a small number of participants from the departments of fishery (19%), architecture (25%) and mechanical engineering (5%), had testified to have seen the use of emails for the teaching and learning of English.

Social media

The use of social media such as Facebook and Twitter for enhancing English teaching and learning was considered to be uncommon in the departments accounting, civil, mechanical and electrical engineering. That is the case because no students from these departments have witnessed the use of this application in their English learning activities. Although the frequency rate was not that high, students from several different disciplines including agriculture (47.4%), fishery (4.8%), architecture (20%) and business administration (10.3%) admitted to have seen their English teachers incorporating this application in their English teaching.

Instructional films

Instructional films, despite their still low frequency rate, have begun to be common items in this institution. A number of students from most departments with the exception of mechanical and electrical engineering, have witnessed the incorporation of this application in their English classroom learning activities (agriculture: 26.3%; fishery: 19%; business administration: 13.8%; civil engineering; 8.7%; architecture: 35% and accounting: 8.7%).

E-learning platform

Despite the availability of the e-learning platform, the usage frequency rate was still low in nearly all departments in this vocational institution. Most students from the departments of civil engineering, business administration, accounting, mechanical and electrical engineering even claimed that they did not witness the use of this medium for supporting English teaching and learning. English teaching and learning practices using this platform, to some extent, could only be seen in the departments of agriculture (10.5%), fishery (14.3%) and architecture (25%).

Video streaming

Like the case of e-learning, video streaming was also considered an unpopular teaching and learning medium in this institution. Only students from three departments (agriculture: 5.3%; fishery: 9.5%; architecture: 35%) who claimed to have seen the use of this application during their English learning journey. While most others from other departments saw no presence of such an application in their English classroom learning activities.

The wellness (or quality) of English teachers' ICT usage and its impacts on students' English learning performance

To figure out the information on the quality of ICT use by English teachers and its impacts on English learning, extensive talks through interviews were carried out with students representing various departments in this vocational higher institution. They were not done through quantitative measures (e.g. English grades, etc.) in order to understand the actual facts behind the phenomenon.

Overall, students asserted that English teachers working as academics in this institution possessed a fine degree of ICT usage. None of them expressed that their English teachers could not incorporate them well enough in their teaching of English. Such an argument could be made following some comments made by some students of this institution:

I think my English teachers are fine users of certain ICT applications. I have been in diploma 3 three classes for nearly two years, and I saw no one having difficulties in using common ICT applications for English teaching and learning related activities (Student of Acc. department).

My English teachers can use ICT quite well in the classroom. I believe they can do this because they have undergone an extensive training of using certain applications for the teaching of English (Student of Agriculture).

I have seen that my English teachers have been great users of ICT when they perform their English teaching (Student of Fishery).

Students who were interviewed in this study also testified that the incorporation of ICT had an influence on their learning performance. Some positive gains were noted during interviews with them. These students argued that the presence of ICT in their English classrooms could help them:

- achieve a better understanding of English materials brought by their English teachers;
- connect to the real world situations (e.g. seeing how the native speakers of English use their English for daily communication);
- develop networks with other English learners from different places;
- access authentic English materials;
- connect with their English teachers and colleagues outside formal learning hours; and
- experience a meaningful English learning in a digital world.

In short, the interviews with students observe positive outcomes as to the use of ICT for the teaching and learning of English in this vocational higher institution.

Conclusion and recommendation

The use of ICT for the teaching and learning of English in this vocational institution, if seen from the variety of applications used, is far from ideal because much of the learning is still dominated by the incorporation of the so called old-fashioned applications (e.g. PowerPoint presentation, word processors) while the more modern ones are still rarely or never used. However, we too must not be misled by English teachers' ability in using various ICT applications including the ones considered to be modern (e.g. social media, E-learning platform, video streaming, etc) because it is not these applications which influence learning but English teachers' pedagogical competence does. This is not to say that advanced knowledge of ICT applications is not important. It is indeed important. But, its standalone existence is not a guarantee for achieving a successful English learning with ICT. Therefore, two important skills should be possessed by an individual English teacher. They are ICT use ability (or often referred as technical knowledge skill) and pedagogical competence (e.g., ability in managing the class, coping with learners demonstrating different learning abilities, linking the English teaching with curriculum expectations, developing closed partnerships with learners, directing classroom activities with learning objectives, maximizing teaching with the available learning resources, etc).

ICT experts (e.g., Lim & Chai, 2008; Marwan & Sweeney, 2010) see teachers' expertise in dealing with teaching and learning (or pedagogical competence) as something extremely valuable and therefore is recommended in the incorporation of ICT into teaching and learning to continuously enhance their pedagogical understanding. A lot of ICT integration failures are mostly caused by teachers' low level of pedagogical understanding.

This study records a somewhat sound pedagogical knowledge demonstrated by several English teachers of the concerned vocational institution. Data collected through interviews showed that despite the utilization of some old-fashioned applications by their English teachers, students from some departments, in this institution, could feel the positive impacts of teachers' teaching of English using ICT. They experienced a new learning which enabled them to break long held boundaries or barriers. With ICT, they now can view the world more meaningfully. They, for example, can connect with people (e.g., other students who learn English from different places) whom they never met before and share their knowledge or learning with them. Indeed, these positive attainments should be well recorded by the administrators of this vocational institution for evaluation purposes, the results of which, for instance, can be used for providing rewards to those who have been successfully mixing their ICT skills and pedagogical competence.

This study, as can be seen from the ICT frequency data, also observed some low frequent uses of certain ICT applications especially the ones under the category of more modern applications (e.g. social media, video streaming, etc). This matter can be a serious one in the future if it is not properly considered. Students, for example, may miss a more meaningful English learning experience (the kind of which that can bring them to acquire English skills better and faster) due to their English teachers' lack of mastery of such important skills (i.e., the skills of using more modern ICT applications). Accordingly, the problems underlying the low rate of ICT usage frequency should be figured out and certainly appropriately dealt with. If, for example, the main cause of this matter is due to English teachers' non-ability of using certain modern ICT applications, the concerned institution then needs to provide them with the relevant training and more importantly show them a good model which they can use as a reference when they bring these applications into their English classrooms. Such a model can also be originated from the schools or other higher institutions which have successfully integrated ICT into their educational programs (including English) as reported by other researchers (see, for example, Tearle, 2004).

Overall, this study observes some limitations concerning the use of ICT by English teachers of this vocational institution (e.g. low frequency rate of certain applications) and thus, recommends them to be well taken care of by the administrators of this institution. However, it is not the main aim of this research to merely deal with the negative aspects associated with the issue under investigation. Rather, it seeks to view the case in a more balanced way. So, it is also fair to say that some good English teaching and learning practices (with ICT) have also been put in place and such fine performances need to be well maintained and of course continuously improved for the sake of students' English learning.

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Editor's Note There is much debate about what is a teaching aid and what is a learning tool. As we move from teacher-centered to learner-centered pedagogy, the student assumes more responsibility for the learning process and materials of instruction are more than an aid – they become a prime source or resource for instruction. Computer technologies are inherently interactive, making them excellent for building engaging lesson materials.

Impact of computer aided learning technologies on student's attainment

M. T. Nehete and V.G. Wagh

India

Abstract

This paper examines the notion of how to improve learning environment by providing necessary support using interactive computer aided learning (ICAL). This study shows the effect of interactive computer aided learning (ICAL) for conceptual understanding of Parser. Self-learning computer simulation packages have been successfully used to promote conceptual growth in understanding and skill developing among its learners. Different types of learning material are available in the market, but simulations shows enhancement in understanding and problem solving abilities. A full-fledged self-learning interactive tool motivates the learner for self-confidence development, acquiring knowledge and improves concept understanding. Computer technology has been demonstrated to enhance classroom instruction by making learning more engaging, and by providing new ways of teaching complex concepts and critical thinking.

Keywords: Parser, ICAL package

Introduction

Research on the learning and teaching of the Parser concept, is essential for cumulative improvement in compiler construction. This study examines the effectiveness of traditional method and research based method. The goal of this research is to identify potential and actual obstacles to student learning, and then to address these obstacles in a way that leads to more effective learning. Another goal is to find out the students ability to learn the concepts. Research in this study includes the study of conceptual understanding of parser concepts.

Study of parser is an important area in compiler construction. Most of the study of compiler construction depends on these concepts. Using conventional classroom teaching, the teacher tries to import them. But there is some natural constraint while doing this. Use of educational technology is the best option to gratify the need of students. A teacher knows that all students are different. Not all students have the same background and not all students learn in the same way. However, many of our conventional approaches to education use a rigid procedure for all students, and there is a stigma against different approaches. The ICAL package uses the computer as a self-contained teaching machine, in order to present discrete lessons to achieve specific educational objectives.

Traditional approaches of teaching parser concepts consist of presenting subject material through lectures, in which learners' plays nearly passive roles. [14] Due to this, it is observed that the students remain far from the teachers. If such concepts are not clear, its application becomes difficult.

Improving our standard of teaching using active learning methods [8] is more important today than ever before. Evaluation of teaching materials, which is considered an essential part of their design, refers to empirical research intended to discover how successful the materials are for learners. Method for evaluation includes process-oriented observations of learners working on any tasks.

SLA (Second language acquisition) research [3] provides some clear guidance for the evaluation of instructional activities

A central role and the process- awareness of authoring tools [2] are reflecting the semantic evaluation of e-learning systems. The purpose of this study is to outline the state-of-the-art research along evolutionary lines to suggest a realistic way towards the educational semantic web. Radford Allyn [9] implies the strategic development of educational models that are designed to exploit current technological opportunities by placing the issues in context and challenging both new and traditional models. The interactive communication tools will transform our capability to embrace an educational paradigm that deals with learning as a vital, fulfilling and continuing part of life at home and in the workplace as well as within educational institutions. The analogies can be used productively to teach in a large enrollment course [12].

Software visualization is the process of producing a visual image to represent the operation of a program or algorithm .The aim of Software visualization in teaching is to increase learners understanding of concepts through simplification. Compiler generators produce human readable parsers for the specified grammar given by the user. Grammar is used to formalize the syntax and semantics of a language. Software visualization is effective in teaching programming concepts to new users. The compiler visualization would need to simplicity the concern raised by demonstrators, as to increase the use of visualization in the teaching theory of compiler [4].

In many computer science curricula, compiler and programming language implementation courses are integral parts. Though, the variety of topics necessary to teach in such a course is difficult for students to understand and time consuming to cover. Authors present Frances, a tool for helping students to understand code generation and low level languages. The key idea is to graphically demonstrate the relationships between high level language constructs and low level language code. Authors used a tool in the compiler design course and received highly positive reaction from students. Students express that use of tool significantly helped them to understand the concepts which is necessary to implement code generation in a compiler project [13].

Project development

The simulation package is organized into following topics:



Figure 1. Types of parser

Procedure

In the first phase of research pre-test was conducted for the checking of initial knowledge of the target group and marks obtained by the students were noted. After taking the pre-test of all students, they are divided in to two groups as control group and experimental group. The experimental group students were asked to study the computer simulation package. This simulation package is done with the help of a series of interactive animated slides with relevant audios attached. Topics are explained with the help of audio-vision supported by animation. Students were given a freedom to repeat a topic till their satisfaction. A post-test of both groups was taken after applying the solution methods on both the group.



Figure 2. Implementation strategy

Observations

Data analysis of control group

After the pre-test, a traditional teaching method is applied for the control group. A method rise in score of the post-test is observed, and shown graphically.



Graphical representation of the performance of the control group

Graph1. Comparison between scores of the pre-test and post-test from the control group.

Table1
Pre-test and post-test data from the control group

Test	Number	Mean	S.D.	Paired t-test
Pre-Test	30	11.8	3.53	6.5
Post-Test	30	14.36	3.30	



Graph 2. Mean scores of the pre-test and post-test from the control group

Data analysis from the experimental group

After the pre-test, an experimental method (use of software package) was used for the experimental group. Using a method rise in the score of the post-test was observed, which is shown graphically.



Graphical presentation of the performance of the experimental group

Graph3: Comparison between pre-test and post-test scores from the experimental group.

Table 2Pre-test and Post-test data from the experimental group

Test	Number	Mean	S.D.	Paired t-test
Pre-Test	30	11.4	3.82	10.82
Post-Test	30	16.26	3.24	10.82





The experimental group shows effective gains in the scores of the post-test as compared to the control group. Now, the next comparison is between the post-test scores of the control group and the experimental group, which is shown in the following table.

 Table 3

 Comparison of the 't' value with table value for EG & CG

Group	No. of students	Table Value	Calculated t-value
Control group	30	2.045	6.5
Experimental group	30	2.045	10.85



Graph 5. Comparison of post-test scores from the control group and the experimental group

Results

Pre-test data was near or about equivalent for both the groups. The mean score of the control group was 11.8, and the experimental group was 11.4, which is similar numerically. There is a significant difference in the results of the post-test. There is an increase in the score of the post-test as compared to the pre-test. Now, the mean score of the control group for the post-test is 14.36, and the experimental group was 16.26

Table 4
Performance of the pre-test and post-test from the control group and the
experimental group

_ . .

Group		Pre-test	Post-test	t-value
Control Group	Ν	30	30	6.5
	Mean	11.8	14.36	
	S.D.	3.53	3.30	
Experimental Group	Ν	30	30	10.82
	Mean	11.4	16.26	
	S.D.	3.82	3.24	

The above table shows the mean, standard deviation and paired t-test value for the pre-test and the post-test of the control group and the experimental group. The class average from the post-test for the experimental group was significantly higher than the control group. Statistical analysis from the control group on calculating 't' indicated that t=6.5 for 29 degrees of freedom (for a sample size N=30). This value of 't' is higher than the standard or table value of 2.045 (for 5% level of significance) and 2.756 (for 1% level of significance) and statistical analysis for the experimental group for calculating 't' indicated that t=10.82 for 29 degrees of freedom (for a sample size N=30). This value of 't' is higher than the standard or table value of 2.045 (for 5% level of and 2.756 (for 1% level of significance). It concludes that student's performance is increase by using ICAL package for "Parser" concepts.

Conclusion

The t-test value is significant, which shows that the use of multimedia software package for parser is more effective than the conventional classroom teaching. The multimedia software package developed by researchers on the Parser concept is effective, and enhances student's acquisition of knowledge, understanding and skill development.

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