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Editorial

Instructional Design 5: Setting goals and objectives

Donald G. Perrin

Bloom's taxonomy of behavioral objectives identifies three domains - Cognitive, Affective, Psycho-Motor. Learning styles impact all domains of learning. Cognitive encompasses factual data and real experiences. Affective relates to attitudes and valuing of the experiences and outcomes. Psychomotor involves coordination of senses and motor activities, as with hand-eye coordination, athletic events, and dance. Learner attributes and learning styles influence the way in which the learner is able to use and combine aspects of these domains in the learning process.

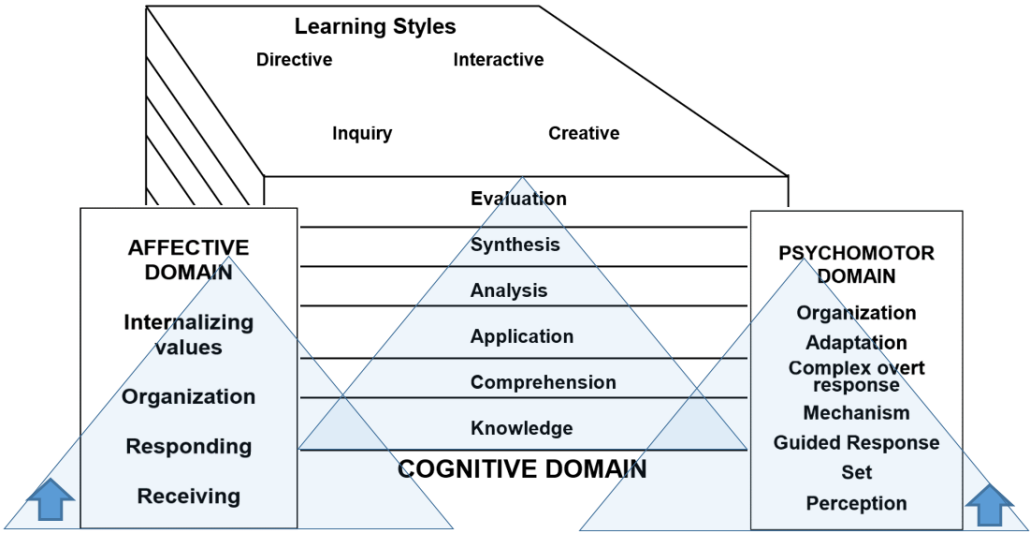

Figure 4. Bloom's Domains related to the Learning Styles Inventory

- Cognitive learning (content, conceptualization, and application) is important to achieve higher levels of learning
- Affective learning (attitudes and values) enriches self-expression, communication and relationships.
- Psychomotor skills are embrace all forms of physical coordination and performance.

In the cognitive domain, the complexity of information increases as you go from knowledge to comprehension, comprehension to application, and continue to higher levels of learning. There is a similar progression from base to apex in the affective and psychomotor domains. Understanding these relationships is important in conceptualizing, designing, presenting and evaluating lessons to meet the needs of individual learners.

For competency based learning, things should be taught to at least the application level, which requires mastery of knowledge and comprehension. Higher level skills include analysis, synthesis, and evaluation. Higher level learning (the top of the pyramid), require an increasing base of knowledge and experience as the pyramid extended upward. For this reason, mastery at each level is important for success at a higher level.

Goals and objectives are best stated in performance terms: an action verb, an observable and measurable outcome, and conditions under which success in achieving the criterion is demonstrated and measured.

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Editor's Note: Rote learning is widely used to learn vocabulary because students do not have alternative strategies or combinations of strategies that would make learning more effective. This study opens the door to consideration of several strategy options that may enhance vocabulary learning.

English vocabulary learning of Iranian university students and its relation to age and gender

Marjan Moiinvaziri and Rahman Sahragard
Iran

Abstract

With increased focus of second language acquisition research on individual differences in language learning and on learner-centered language education, language learning strategies were brought to the fore as an interesting topic that warranted much research. At the same time, vocabulary, once a neglected aspect of language learning has been much studied following the advent of communicative approaches to teaching.

This research tries to a) determine the most and least frequently used categories of vocabulary learning strategies (VLS) by Islamic Azad University students of Sirjan and b) find out whether there is any significant relation between the kind of vocabulary learning strategy used and students' age and gender. The instrument used in this study was a 46 item revised version of a vocabulary learning questionnaire adapted from Gu and Johnson (1996) which was given to 220 students having a General English Course at Islamic Azad University of Sirjan. The questionnaire was divided into eight parts. The first part was concerned with beliefs about vocabulary learning while other seven including metacognitive regulation, guessing strategies, dictionary strategies, note-taking strategies, memory strategies (rehearsal), memory strategies (encoding) and activation strategies examined the students' vocabulary strategy use. The respondents were asked to rate each strategy statement on a 5-point interval Likert scale in term of their frequency of use in ascending order ranging from 1 (almost never) to 5 (almost always).

The results of the study showed no significant difference among different age groups' use of strategies but a significant difference was detected among males and females use of memory: rehearsal and activation strategies.

Keywords: vocabulary, learning, strategy, gender, age, belief, university students, General English.

Introduction

Vocabulary is one of the smallest and the most important components of a language. As it is often cited in the literature, "without grammar, very little can be conveyed. Without vocabulary, nothing can be conveyed" (Wilkins, 1972:11). Although vocabulary was one of the important parts of foreign language learning; it was neglected in second language learning and teaching before the mid-1980s (Maiguashca, 1993; Meara, 1981). Since 1990s, there were a number of research studies and currently vocabulary learning is one of the major focuses in ESL pedagogy and research. For EFL learners, vocabulary learning can become a burden. Vocabulary learning is considered one of the most challenging tasks that language learners face; they feel that the lack of vocabulary prevents them from reaching higher levels of English proficiency (Gan, Humphery, & Hamp-Lyons, 2004; Hirsh, 2010). Not having enough vocabulary could lead to serious problems in language reception and production. Besides, most students complain about the difficulty of learning and memorizing the new vocabulary items.

Vocabulary learning strategies (VLS) as part of language learning strategies received increasing attention since the late 1970s and these studies have advanced our understanding of the way learners develop their skills in a second or foreign language. It is known that different students use different processes to take in or comprehend information. Therefore, in regard to vocabulary learning strategies, it is believed that different students may use different strategies and some may use a fewer numbers of strategies than others or may not have an effective strategy to help their learning activities.

The view of Gairns and Redman (1986) is that students should be more responsible for their learning and teachers should pay greater attention to individual needs. It might be because of the fact that after elementary level, it becomes increasingly difficult for teachers to select vocabulary which can be useful to all students. Schmitt (2000) believes it is necessary to help learners acquire the strategies necessary to learn words on their own. By studying the literature, one can find empirical evidence that strategy use will result in more effective vocabulary acquisition and recall among L2 learners. This fact explains why teachers should embark on strategy training. Even some scholars, who believe that context is the main source of vocabulary, have expressed their concern about the students' ability to handle the context on their own. Therefore, it has been suggested that for the effective learning of the context, students need to be taught some specific learning strategies (Coady, 1997).

This study reports the findings of an empirical investigation of vocabulary learning strategies carried out in Sirjan, Iran. Specifically, it examines the overall vocabulary strategy use and belief of Iranian University students and its relation to their age and gender. It is hoped that this study can get us closer to a more comprehensive understanding of vocabulary learning practices of Iranian learners and provide some guidance for both the learning and teaching of vocabulary in the context of English as a foreign language (EFL).

Significance of the study

This study aims to look into students' vocabulary learning strategies. It is believed that curriculum designers and EFL educators should consider individual differences in language learning when performing their roles in teaching and learning. In this way they can help students to become more aware of ways to learn more effectively and by matching learning and teaching styles to develop students' potentials in EFL learning. Furthermore, by developing different strategies, students become more motivated and independent in their learning. Understanding the students' beliefs of vocabulary learning and their vocabulary learning strategy enables teachers and researchers to design appropriate materials and activities to help students improve their vocabulary learning and enhance their lexical competence.

Objectives of the study

This study was designed to investigate the vocabulary learning strategies used by Islamic Azad University students of Sirjan in learning English. Specifically, the study sought answers to the following questions:

1) What are the most and the least frequently used categories of vocabulary learning strategies by Islamic Azad University students of Sirjan?
2) Are Islamic Azad University students of Sirjan, high, medium, or low vocabulary learning strategy users?
3) What is the students' belief towards learning vocabulary? Do they believe in specific methods of vocabulary use or memorization?

4) Is there any relation between students' belief toward vocabulary learning and their gender and age?

5) Is there any relation between gender and each of the seven mentioned strategies?

6) Is there any relation between age and each of the seven mentioned strategies?

Review of the literature

Background on language learning strategies

In recent years, second language acquisition research has increasingly focused on individual differences and learner-centered teaching and learning; as a result language learning strategies have been brought to the attention as an interesting topic which requires much research.

Interest in learning strategies first developed in the 1970s. Some studies focused on the characteristics of good language learners (Naiman et al., 1978; Rubin, 1975). In 1966, Aaron Carton published his study entitled "the method of inference in foreign language study" which was the first attempt on learner strategies. After Carton, in 1971, Rubin started doing research aimed at identifying strategies used by successful learners that could be made available to unsuccessful learners. Rubin (1979) classified strategies in terms of processes contributing directly or indirectly to language learning. Many others like Wong-Fillmore (1976), Tarone (1977), Naiman et al. (1978), Cohen and Aphek (1981), Chamot and O'Malley (1987) studied the strategies that students used in their process of learning a foreign language.

Vocabulary learning strategies

By the advent of communicative approaches to language teaching vocabulary, the neglected aspect of language learning, gradually won the attention of pioneers in the field. It is widely accepted today that to learn English as second or foreign language, an individual has to acquire a large amount of lexicon. In addition, some studies in corpus linguistics have shown that a high proportion of language used in speech and writing is prefabricated language (Rott, 2004). Thus, to have a good understanding of what they hear or read in foreign language or to express themselves fluently, language learners need to develop a sufficient knowledge of L2 vocabulary (Lehr, Osborn, & Hiebert, 2004; Nation, 2006). According to Michael McCarthy, "Vocabulary forms the biggest part of the meaning of any language, and vocabulary is the biggest problem for most learners. So I have always been interested in ways of helping learners to build a big vocabulary as fast and as efficiently as possible" (as cited in Fan, 2003: 222).

Considering vocabulary as a central and important part of second or foreign language learning, encourages researchers to look for the most effective ways of learning vocabulary and help L2 learners to foster growth of their vocabulary. Language learners usually combine a variety of strategies and these strategies are chosen based on their beliefs toward vocabulary learning or some pre-existing cognitive or social factors (Gu, 1994; Sanaoui, 1995; Shapiro& Waters, 2005). Therefore, how different learners combine different strategies and how this affects their learning outcomes warrant study, perhaps more than the effects of individual strategies (Gu & Johnson, 1996).

The main benefit gained from strategies is that they foster "learner autonomy, independence, and self-direction" (Oxford and Nyikos, 1989: 291). A good knowledge of strategies and ability to apply them in suitable situations might considerably simplify the learning process of new vocabulary for students (Ranalli, 2003:9). Nation (2001) believes that with the help of vocabulary learning strategies, a large amount of vocabulary could be acquired. As learning strategies are "readily teachable" (Oxford and Nyiko, 1989:291), teachers can dedicate some part of the class time to teaching different vocabulary learning strategies.

Many researchers and linguists have presented different categories and classifications of vocabulary learning strategies. Oxford (1990) developed a categorization system which includes a list of six major vocabulary learning strategies: (1) memory, (2) cognitive, (3) compensation, (4) meta-cognitive, (5) affective and (6) social. Schmitt (1997) claimed that the lack of attention to vocabulary learning strategies is due to the lack of a comprehensive list or taxonomy of vocabulary learning strategies. He utilized Oxford's (1990) taxonomy and added new categories so that the overall taxonomy can be divided into discovery strategies (initial discovery of a word's meaning) and consolidation strategies (remembering the word once it has been encountered). Based on different categorizations of VLS a number of questionnaires were developed one of which was presented by Gu and Johnson (1996) administered in Mainland China. Gu and Johnson (1996) list second language (L2) vocabulary learning strategies as: meta-cognitive, cognitive, memory and activation strategies. Meta-cognitive strategies consist of selective attention and self-initiation strategies. Employing selective attention strategy means that L2 language learners can realize which words are important for learning or understanding the passage. Using self-initiation strategy means that the learner can use different means to get a clear meaning of the vocabulary item. Cognitive strategies in this taxonomy include guessing strategies, skillful use of dictionaries and note-taking strategies. Guessing strategies include skills of using background knowledge or linguistic clues to guess the meaning of a word. Memory strategies are two types: rehearsal and encoding. As an example of rehearsal strategies one can mention word lists or repetition and for encoding strategies association, imagery, visual, auditory, semantic, and contextual encoding as well as word-structure (i.e., analyzing a word in terms of prefixes, stems, and suffixes). Strategies in which learners use the new words in different contexts are named as activation strategies. For example learners make new sentences using the new lexicons (Lotfi, 2007)

The existing evidence indicates that the belief that vocabulary is simply the memorization of separate word forms with fixed meaning is too simplistic and inadequate for the learner to build up his/her lexical knowledge. However, what has been neglected is that the actual beliefs, needs and problems of learners might be connected with strategy use, which in turn will affect effectiveness of the learning process. It was hoped that this study could present a comprehensive framework of the vocabulary learning strategies used by Islamic Azad University students of Sirjan and its relation to gender and age in order to help teachers in their methods of teaching vocabulary and students in their vocabulary learning.

Vocabulary learning in Iran and in Islamic Azad University of Sirjan

Vocabulary is generally given little emphasis in the university curriculum in Asian countries (Fan, 2003). Iran has an input-poor EFL environment and vocabulary learning tends to be discrete (e.g., Gu, 2003a): Once students step out of the classroom, they simply do not need to speak or listen to English. Generally, the emphasis on English teaching in universities in Asian countries is on the four skills. Vocabulary teaching in many classrooms is largely incidental (Fan, 2003; Catalan, 2003). Considering this fact in many classes, a number of linguists have long recognized the importance of learner independence in vocabulary acquisition.

In Islamic Azad University most of the students take a two credit course of English called Pre-university English and all of them have to pass a three credit course called General English. An average of 40 students with different fields of study attends these courses, two sessions a week (each 75 minutes). The purpose of the course is primarily reading comprehension in which there are a large number of new words presented. Students usually complain about difficulty in learning and retaining new vocabularies. One of the major concerns of this study is detecting students' VLSs that students use in order to help them deal with their vocabulary learning problems.

Method

Participants

Two hundred and twenty students of Islamic Azad University of Sirjan (118 male and 102 female) who were currently enrolled in the General English course, with different majors and different ages, took part in the study. Students in the General English course were selected instead of those having the pre-university English course because not all students will pass the pre-university English course. Furthermore, the advanced group had enough language learning experience to answer the vocabulary learning strategy questionnaire. The participants were selected among different majors of Islamic Azad University of Sirjan including: Computer, Management, Architecture, Accounting, Industry, Metallurgy and Civil Engineering.

Instrument

The instrument used in this study was a revised 46 item vocabulary learning questionnaire adapted from Gu and Johnson (1996). It was divided into three parts. The first section elicited the respondents' demographic information: gender, age, field of study, degree and self-elicited English proficiency. The second part included 12 items regarding students' beliefs toward VLSs. The third section was 34 items representing four categories of meta-cognitive strategies, cognitive strategies (guessing, use of dictionary, note-taking), memory strategies and activation strategies.

Procedure

The original questionnaire contained 108 items and the students answered a 7-point Likert scale but after the pilot study, considering the cultural differences and also the fact that the students were not English majors and as a result they were not familiar with some of the strategies and did not use them at all, the number of items was reduced. The respondents were asked to rate each strategy statement on a 5-point interval Likert scale in terms of their frequency of use in ascending order ranging from 1 (almost never) to 5 (almost always).

The questionnaire was translated into Persian and, to validate the questionnaire in terms of wording and comprehension, university professors were consulted and as measured by Cronbach's alpha, it showed an overall consistency of 0.79.

Data collection

The instrument required about 15 minutes to complete and it was administered in students' regular General English class. There were 12 General English classes this semester (with average of 40 students) from which subjects were selected randomly. Before filling out the questionnaire, students were told that their participation was voluntary and their responses would remain confidential. Instruction as to how to complete the questionnaire was given in Persian.

Data analysis

The data gathered through the questionnaire were coded for statistical analysis to answer the research questions indicated above. The Statistical Package for the Social Sciences (SPSS, version 13) was used for statistical analysis. Descriptive statistics (frequencies, percentages, means and standard deviation), Independent-samples t-test and one-way ANOVA, Duncan multiple range test and Tukey's b test were used for analyzing data.

Coding scheme:

There were two beliefs toward English vocabulary learning: memorization of words and use of words, also seven different strategies which were coded as follow:

Beliefs:

Memorization of words: word memo (5 questions)

Use of word: word use (7 questions)

Vocabulary learning strategies:

Meta-cognitive regulation (MET) (6 questions)

Guessing strategies (GUE) (5 questions)

Dictionary strategies (DIC) (4 questions)

Note-taking strategies (NOTE) (5 questions)

Memory strategies: Rehearsal (REH) (5 questions)

Memory strategies: Encoding (ENC) (6 questions)

Activation strategies (ACT) (3 questions)

According to Oxford (1990, p. 300), mean scores that fall between 1.0 and 2.4 are identified as "low" strategy use, 2.5 and 3.4 as "medium" strategy use, and 3.5 and 5.0 as "high" strategy use. These categories of ratings were theoretically and arithmetically chosen.

low	Medium	High
1.0	2.4- 2.5	3.4-3.5 5.0

Figure 1: Oxford's categorization of the amount of strategy use

Results and discussions

Overall strategy use

A preliminary examination of the data showed that the average mean for frequency of strategy use ranged from 2.01 to 2.86, with a mean of 2.42, which indicated an overall low strategy use. The most frequently used strategy was memory: rehearsal strategy and the least used strategy was activation strategy.

Table 1
Total mean-score of each strategy used by the students

		METM	GUEM	DICM	NOTEM	REHM	ENCM	ACTM
N	Valid	220	220	220	220	220	220	220
	Missing	0	0	0	0	0	0	0
Mean		2.2788	2.3218	2.7364	2.2991	2.8664	2.4712	2.0106
Mode		1.67	2.20	3.00	2.00	3.40	2.00	1.33

The results of the study revealed that the students reported the use of most of the strategies at the low level, with memory strategy: rehearsal at the highest end of the frequency scale and activation strategies at the lowest end. The least attention paid to activation has also been observed by Gu and Johnson (1996). In contrast, memory: rehearsal strategies have been widely used among learners. This contrast suggests that de-contextualized rote learning is still predominant in VL compared to contextualized processing. As mentioned before, all students were non-English majors. This may be the reason for the low amount of strategy use among them.

Overall belief toward method of vocabulary learning

The first 12 questions in the questionnaire asked students about the most appropriate way of learning new vocabulary. The methods were classified into two groups of word memorization and word use. The results as shown in the following table illustrated that students believed in word use as a more appropriate way of learning vocabulary than word memorization.

Table 2
Student's total belief toward method of vocabulary learning

		BE. word memo	BE. word use
N	Valid	220	220
	Missing	0	0
Mean		3.2618	3.8286
Mode		3.20	3.71
Minimum		1.80	2.29
Maximum		5.20	5.00

Gender, beliefs and strategies

In order to find whether there was a difference in males and females beliefs toward the method of memorization or learning vocabularies, a t-test with a level of significance $p<0.05$ was used. The results with significance of 0.537 showed that there was no significant difference between different genders' beliefs toward word memorization and with a mean of 3.2 they were medium believers in word memorization.

Table 3
Mean score and standard deviation for males and females belief toward word memorization.

	Sex	N	Mean	Std. Deviation	Std. Error Mean
Belief: Word memo	Female	102	3.2882	.58331	.05776
	Male	118	3.2390	.59356	.05464

Table 4
T-test results for differences among males and females' belief toward word memorization.

Belief: Word memorization	Levene's test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
	F	Sig	t	df	Sig. 2-tailed	Mean difference	Std. error difference	Lower	Upper
equal variances assumed	.025	.875	.619	218	.537	.25	.398	-.538	1.031
equal variances not assumed			.619	214.425	.536	.25	.398	-.537	1.030

T-Test results for finding whether there was a difference in males and females beliefs toward the method of word use for learning vocabularies was 0.079 showing there was no significant difference between genders' belief toward word use. With the mean-score of 3.8 for males and 3.7 for females, both were strong believers in word use.

Table 5
Mean score and standard deviation for males and females belief toward word use.

	Sex	N	Mean	Std. Deviation	Std. Error Mean
Belief: Word use	Female	102	3.8894	.46754	.04629
	Male	118	3.7760	.48146	.04432

Table 6
T-test results for differences among males and females' belief toward word use

Belief: Word memorization	Levene's test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
	F	Sig	t	df	Sig. 2-tailed	Mean difference	Std. error difference	Lower	Upper
equal variances assumed	.027	.870	1.764	218	.079	.79	.450	-.093	1.679
equal variances not assumed			1.768	215.047	.078	.79	.449	-.091	1.678

Regarding males and females use of the seven mentioned strategies, a t-test was used. The results in the following table show that there was no difference between males and females in use of meta-cognitive, guessing, dictionary, memory encoding and note-taking strategies. However, a level of significance of 0.010 showed a significant difference among different genders' use of memory strategy: rehearsal. Females used this strategy significantly more than males. There was also a significant difference in the use of activation strategies. With a level of significance 0.021, males used it more than females.

Table 7
Results of males and females total beliefs and strategy use.

		Levine's Test for Equality of Variances		t-test for Equality of Means				
							95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Lower	Upper
belief: word memo	Equal variances assumed	.025	.875	.619	218	.537	-.538	1.031
	Equal variances not assumed			.619	214.425	.536	-.537	1.030
belief: word use	Equal variances assumed	.027	.870	1.764	218	.079	-.093	1.679
	Equal variances not assumed			1.768	215.047	.078	-.091	1.678
meta-cognitive	Equal variances assumed	2.186	.141	.214	218	.831	-.957	1.190
	Equal variances not assumed			.216	217.964	.829	-.946	1.180
guessing	Equal variances assumed	6.138	.014	-.901	218	.369	-1.348	.502
	Equal variances not assumed			-.917	215.654	.360	-1.331	.486
dictionary	Equal variances assumed	.638	.425	.088	218	.930	-1.000	1.094
	Equal variances not assumed			.088	205.317	.930	-1.008	1.102
note-taking	Equal variances assumed	.105	.746	.139	218	.890	-1.079	1.242
	Equal variances not assumed			.139	215.265	.890	-1.076	1.239
memory: rehearsal	Equal variances assumed	.605	.437	2.593	218	.010	.338	2.482
	Equal variances not assumed			2.577	207.096	.011	.331	2.489
memory: encoding	Equal variances assumed	.954	.330	.136	218	.892	-1.137	1.306
	Equal variances not assumed			.136	210.035	.892	-1.142	1.311
activation	Equal variances assumed	2.048	.154	-2.317	218	.021	-1.429	-.115
	Equal variances not assumed			-2.337	217.799	.020	-1.423	-.121
beliefs/T···	Equal variances assumed	.050	.823	1.693	218	.092	-.17032	2.24941
	Equal variances not assumed			1.709	217.933	.089	-.15905	2.23815
Strategy/T	Equal variances assumed	1.067	.303	.214	218	.831	-4.46974	5.55947
	Equal variances not assumed			.216	217.695	.829	-4.43018	5.51991

Table 8
Mean score and standard deviation for males and females' use of memory strategy: rehearsal

	Sex	N	Mean	Std. Deviation	Std. Error Mean
REHM	Female	102	3.0176	.84013	.08319
	Male	118	2.7356	.77256	.07112

Table 9
Mean score and standard deviation for males and females' use of activation strategy.

	Sex	N	Mean	Std. Deviation	Std. Error Mean
ACTM	Female	102	1.8725	.76939	.07618
	Male	118	2.1299	.86400	.07954

Gu and Johnson (1996:679) pointed out that "students consistently adopt types of strategies based either on their beliefs about vocabulary and vocabulary learning, or on other pre-existing cognitive or social factors". The results of the present study indicate that both male and females are generally aware of the importance of the ability to use words in speaking and writing in appropriate contexts. This is encouraging evidence that students understand that knowing a word involves not only knowing the form and meaning, but also the context and the ability to use it.

With regard to the overall strategy use, there was no difference between males and females. Both were low strategy users. But by looking more specifically, females reported more use of rehearsal strategies than males. On the other hand, males showed more use of activation strategies. Therefore, the results of the present study are not consistent with several other studies that have reported that female learners use strategies with greater frequency than male learners (e.g. Oxford & Nyikos, 1989; Green & Oxford, 1995; Kaylani, 1996). The fact that females use rehearsal strategy more than males may suggests that de-contextualized rote learning is more predominant among females in VL compared to contextualized processing. Furthermore, the influence of second language learners' cultural background and the educational settings in which they learn on the choice of their learning strategies has been the subject of several research studies (Oxford, 1989; Oxford & Nyikos, 1989; Green & Oxford, 1995). Results of the present study may further confirm the following observation made by Green and Oxford (1995:291) that "...gender difference trends in strategy use are quite pronounced within and across cultures". Males' use of activation strategies more than females might be related to our society, culture and educational system in which men could be provided with more opportunities to use the language in different contexts.

Age and vocabulary learning strategies

Participants were categorized into three groups based on their ages. The first group consisted of students with the ages 17 to 20, the second group 21to 23 and the last group 24 and more. The results of one way ANOVA showed that with a level of significance 0.988 for word memorization and 0.403 for word use, there was no difference between different ages' beliefs toward these methods. Furthermore, with the level of significance 0.658 it was confirmed that there was no difference among different ages' total beliefs toward VLSs.

Table 10
Different age-groups' beliefs towards VLSs.

		Sum of Squares	df	Mean Square	F	Sig.
Belief: word memorization	Between Groups	.207	2	.103	.012	.988
	Within Groups	1892.775	217	8.722		
	Total	1892.982	219			
Belief: word use	Between Groups	20.384	2	10.192	.912	.403
	Within Groups	2424.816	217	11.174		
	Total	2445.200	219			
Belief: T	Between Groups	17.520	2	8.760	.419	.658
	Within Groups	4535.862	217	20.903		
	Total	4553.382	219			

Table 11
ANOVA results for the relation between each strategy and different age-groups.

		Sum of Squares	df	Mean Square	F	Sig.
metacognitive	Between Groups	17.013	2	8.506	.524	.593
	Within Groups	3521.423	217	16.228		
	Total	3538.436	219			
guessing	Between Groups	36.288	2	18.144	1.514	.222
	Within Groups	2600.094	217	11.982		
	Total	2636.382	219			
dictionary	Between Groups	63.329	2	31.664	2.081	.127
	Within Groups	3302.017	217	15.217		
	Total	3365.345	219			
notetaking	Between Groups	.146	2	.073	.004	.996
	Within Groups	4132.849	217	19.045		
	Total	4132.995	219			
memory:encoding	Between Groups	41.910	2	20.955	1.002	.369
	Within Groups	4539.526	217	20.919		
	Total	4581.436	219			
activation	Between Groups	14.210	2	7.105	1.148	.319
	Within Groups	1342.567	217	6.187		
	Total	1356.777	219			
Strategy: T	Between Groups	881.936	2	440.968	1.253	.288
	Within Groups	76341.423	217	351.804		
	Total	77223.359	219			

As the Table 11 illustrates, with the level of significance $P<0.05$ there was no significant relation between the different ages and their use of meta-cognitive (0.539), guessing (0.222), dictionary (0.127), note-taking (0.996), memory encoding (0.369), activation (0.319) strategies and overall strategy use (0.288). However, with the level of significance (0.046) there was a difference among different ages' use of memory rehearsal strategy. The use of Duncan multiple range test showed that this difference is not considerable.

Table 12
ANOVA results for the relation between memory rehearsal strategy and different age groups.

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	102.019	2	51.010	3.131	.046
Within Groups	3534.758	217	16.289		
Total	3636.777	219			

Table 13
Duncan test for memory: rehearsal strategy among different age-groups.

Duncan [a,b]

age	N	Subset for alpha = .05
		1
17/18/19/20	150	13.87
24 , and more	26	15.31
21/22/23	44	15.34
Sig.		.106

Means for groups in homogeneous subsets are displayed.

Age has been singled out as one of the clear factors affecting strategy choice (Ellis 1994:541, Oxford 1990:13). Ahmed's study (1989:11) also revealed that the preferences of younger and older learners differed. Although the present results for the difference among different age groups' use of VLSs were not significant, further investigation is needed as the age range of Islamic Azad University students might be considered as a limited age-categorization.

Summary and implication

The results of the present study showed an overall low use of VLS by students of Islamic Azad University of Sirjan who are actually a part of Iranian students. These results regarding strategy use approximately resembles those of other similar studies conducted with Asian students (Politzer and McGroarty 1985; O'Malley et al. 1985).

The students' belief toward vocabulary learning, the relation between student's vocabulary learning strategies and their gender and age was also investigated. It was shown that these factors can have an effect on the students' use of VLSs.

Strategy use is closely related to problems that Iranian students encounter in VL, particularly in long-term retention and the ability to use vocabulary. In a typical EFL environment in Iran, words are primarily taught through de-contextualized activities in English classes. A considerable amount of time in class is assigned to explaining and defining terms. Students are then supposed to learn new vocabulary on their own and they mostly try to learn it by mere memorization without using or having any knowledge of vocabulary learning strategies (Sarani and Kafipour 2008; Zarafshan 2002).Learning vocabulary by memorizing a list of words without a teacher's guidance cannot be effective; teachers can help learners with strategies to enhance their communicative competence in the target language and recognize a much larger vocabulary.

Foreign language teachers and curriculum designers should add and integrate effective strategies to these input-poor EFL environments. They can help students to learn vocabulary by revising English textbooks so the textbooks can facilitate student learning. Pedagogically, it is advisable for teachers to have a more active role in students' vocabulary learning (Oxford and Scarcella, 1994) by providing learners with systematic L2 vocabulary instruction, offering contextualized learning opportunities, helping students learn specific strategies for acquiring words, and showing students how to learn words outside of their L2 classes. The ultimate purpose is to develop learner autonomy so students can use and benefit from different strategies for learning vocabulary both inside and outside of the classroom.

This study, because of the limited number of participants and investigated strategies, caught only a glimpse of the present vocabulary learning situation in Iran. Furthermore, as with other similar studies, data for the study were based on the participants' perception of their learning activities. Since the extent to which self-reports reflect reality is an issue, this study is not meant to offer any conclusive findings about vocabulary learning in Iran. With these limitations in mind, the present study obtained adequate evidence to highlight the importance of employing different strategies in learning vocabulary. English teachers should introduce potentially effective techniques to their students and encourage them to try these strategies. This will also enhance learner autonomy (Kudo, 2000).

The first step is to have students identify what strategies they actually use. The questionnaire used in this study might prove useful for diagnostic purposes to identify what strategies students use or do not use. As a second step, teachers should help their students choose and explore strategies suitable to them that will enable them to learn the target language more effectively. To conclude, the secret to vocabulary learning may include helping students see the relevance of strategy use in learning L2 vocabulary, introducing them to strategies frequently used by proficient vocabulary learners, and most importantly, encourage them to develop their own effective strategies for learning. Hopefully, this study will lead to more thorough investigations of vocabulary learning, particularly in EFL context.

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Editor's Note: Students frequently have the option of learning in classroom *or* online. This study is concerned with ways to make both iterations of the course comparable in content and in student success.

Improving Project Success in an Online Mathematics Course

David Shoenthal
USA

Abstract

An online and a face-to-face section of the same finite mathematics course are compared in each of two different years. After analyzing the data regarding the differences in the two sections for the first year, changes were incorporated in the second iteration that were intended to improve the consistency of project success between the two sections and the success of the class projects in the online section. Mimicking the interaction of group members and providing immediate instructor feedback in the early stages of project completion was the main tool implemented.

Keywords: comparison of online and face-to-face classes, improving success, online mathematics, grading consistency, synchronous group interaction.

Introduction

Online classes aim to provide students with a sound foundation in the topics taught in the course while taking advantage of the asynchronous nature of the online environment. After teaching a finite mathematics course in face-to-face sections for eight semesters and over several summer sessions, the author decided to teach the course fully online in the summer of 2008. Before doing so, the author participated in an Online Technology Institute (LOTI) at his institution. The goal of LOTI is to train instructors of online and hybrid courses about technological tools that could be used in one's courses as well as best practices in teaching. After the completion of a participant's first online course, she or he reflected on strategies to be used to improve one's online course. Anecdotal evidence suggested that students in the online summer section of the finite mathematics course had performed noticeably worse than those in previous face-to-face sections (both regular semester and summer), particularly on group projects and on tests. Potential reasons for the difference included compression of the course into a short time frame, lack of student engagement in studying with others in the section, and lack of participation in the ancillary online study features. In order to clarify where the differences arose, the author devised a more systematic approach to comparing success in these online and face-to-face courses.

In both Spring 2009 and Spring 2011, two sections of a finite mathematics course were taught, one online and the other face-to-face. The goal in Spring 2009 was to determine which aspects of the course (homework, quizzes, group projects, tests, final exam) had significantly different outcomes between the two sections. Based on previous experience, the author expected that some of the averages of the online section would be significantly less. In Spring 2011 the goal was to incorporate ideas that would (1) provide consistency between the averages in online and face-to-face sections, and (2) increase the averages in areas where the online section average was significantly lower. Based on Spring 2009 data, the second goal was specifically targeted at group projects. The interaction among group members, as well as between group members and the instructor, was altered in Spring 2011 in an effort to achieve these goals.

Literature review

Achieving productivity and success in online courses has been studied from standpoints of individual reflections by the faculty who teach them (Ellis-Monaghan, 2010), sets of classes by the same professor(s) (Dewar, Larson, & Zachariah, 2011), and larger group studies of faculty and/or students (Bailey & Card, 2009; Meyer, 2005; Meyer & McNeal, 2007). In Ellis-Monaghan (2010), the author reflects on her experiences teaching online courses and the goal for personal interaction with her students in those courses. The eventual focus of the article, however, was incorporation of technology into face-to-face and hybrid classes.

Active learning within groups in online courses has been echoed in various studies (Tseng, Ku, Wang, & Sun, 2009; Dittman, Hawkes, Deokar, & Sarnikar, 2010; Crawford-Ferre & Wiest, 2012). In their literature review on statistics courses taught using technology from 1999-2009, Mills and Raju (2011) repeatedly find studies confirming the importance of interaction between students and instructor and/or between students and students.

Many studies that focus on success of students in online courses are more concerned with general pedagogical principles, even when addressing mathematics (Glass & Sue, 2008; Hodges, 2009). Studies that have focused on the differences in success between face-to-face and online courses have for the most part found no difference in student success (Block, Udermann, Felix, Reineke, & Murray, 2008; Dell, Low, & Wilker, 2010; Somenarian, Akkaraju, & Gharbaran, 2010; Wagner, Garippo, & Lovaas, 2011). Less has been done to measure or address these differences in the context of an undergraduate mathematics course. Rey analyzed the future success of those taking remedial courses as they began college (Rey, 2010). Use of online homework in both a lecture format (Dedic, Rosenfield, & Ivanov, 2008; Hodge, Richardson, & York, 2009) and in online classes (Pollanen 2007) has been investigated. In a study addressing success in a business statistics class, Dutton and Dutton (2005) found that students in their online section performed better than their peers in a face-to-face class.

Course content and grading

The three credit finite mathematics course which the author taught covers a variety of topics related to applications in business, selecting from topics such as linear and quadratic functions; Gauss-Jordan elimination; matrix algebra; solutions of inequalities; introductory linear programming; introductory probability and statistics; introductory game theory; and mathematics of finance. From 2004 to 2012, three sections of the course were typically offered during the regular academic year (with between 35 and 40 students per section) and one section was offered most summers (with about fifteen students).

The author taught both a face-to-face and an online section of the course in both Spring 2009 and Spring 2011 semesters. A standard text was used in both semesters, with a newer edition used in the later semester (Barnett, Ziegler, & Byleen, 2008; Barnett, Ziegler, & Byleen, 2011). Students were also required to purchase MyMathLab, a course management system for titles published by Pearson. The final grade for students in both semesters and in both sections of the course was determined as follows: 10% for each of the averages of the homework scores and the quiz scores, 12% from the four group projects (weighted equally), 15% for each of the three tests, and 23% for the final exam. Homework assignments were assigned from each of the text's sections covered in the course. Quizzes were assigned through the MyMathLab system on a weekly basis (excluding weeks when there was a test). Students in the online section also completed both the three tests and the final exam for the course using MyMathLab. Group projects were assigned and collected through the course management system Blackboard for both sections of the course.

The text of the homework and quiz questions assigned to both sections of the course was equivalent, up to algorithmically generated numbers on each different student's questions. These

algorithmically generated questions came from the pool of questions available through MyMathLab for the course text. Both the dates for initial availability and due dates for homework assignments and quizzes also coincided.

Students were also given exactly the same four group projects. These projects came from several sources, including modifications of projects from an older version of the text (Barnett, Ziegler, & Byleen, 2005) and a finance project co-written by the author and a colleague. Groups consisted of three or four students chosen at random by the author in advance. These students were then grouped together in Blackboard and given access to a group discussion board and a file exchange to transfer drafts of their projects.

Projects in both sections were graded by the same rubric. While eighty percent of an individual student's grade was based on correctness (content and grammar), ten percent of an individual student's grade was determined by whether that student had completed a group evaluation on all other members of her/his group; and ten percent of the grade was the average grade given to a student by the other members of her/his group on their evaluations. The peer evaluations by students were kept anonymous to encourage honesty in the assessment of the other group members' contributions, preparation, and attitude toward participation. This type of peer review grading has support for being both fair and practical (Pond, Coates, & Palermo, 2007).

Tests given to students in both sections were also identical in terms of content. All three tests and the final exam consisted of short answer questions where students had to have both correct answers and correct justification to earn full credit. Both tests and the final exam given to the face-to-face and online sections differed in two ways. First, students in the online section were allowed additional time on these exams. While face-to-face students were given fifty minutes to complete each of the three tests and one hundred fifty minutes to complete the final exam, students in the online section were given an hour to complete each of the three tests and three hours to complete the final exam. This 20% increase in time, a decision reached after consultation with faculty in the LOTI program, was given to accommodate students in the online section who would use pencil and paper to work through the problems and additionally type their answers into the system to be graded. The other difference in the two sections was that students in the online section could take an exam any time during the day it was given, while the face-to-face students took the exam during scheduled class time. Once a student started the exam in the online section, however, the student was not permitted to stop the exam partway through and restart it. The inability to stop and restart the assignment mimicked the timed quizzes given to both sections, although students could start or stop their homework assignments as often as they wanted before the due date.

Spring 2009

Initially thirty-one students enrolled in the face-to-face section of the course and twenty students enrolled in the online section. However, by the end of the semester, one student had withdrawn from the face-to-face section and three students had withdrawn from the online section. The students who withdrew from the course have not been included in the statistical analysis that follows.

As is common in this type of situation, students self-selected the section of the course in which they wanted to enroll. One graduate student enrolled in the face-to-face course, while all other students in both sections of the course were undergraduates of typical college age; the undergraduates in the online course were full-time students at the university enrolled in other (face-to-face) classes there. A quick visual comparison of the GPAs from the previous semester (Fall 2008) shows that no significant difference exists in at least this measure.

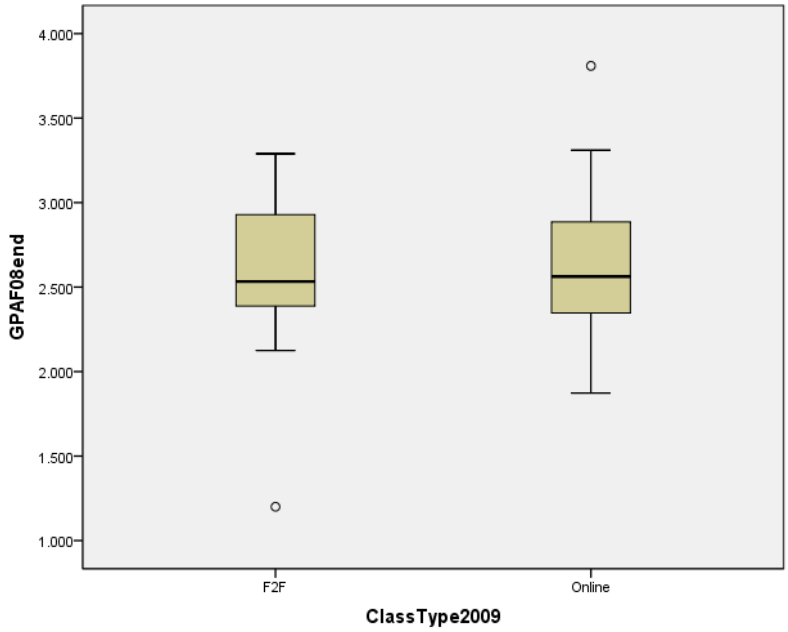

***Figure 1*: Boxplot of fall 2008 GPAs for face-to-face & online spring 2009 sections**

While the rubric for group projects and student assignment to groups was the same between the two sections, the initial distribution of the projects in Spring 2009 differed. In the online section, the project was posted to Blackboard for each group to view, and students were encouraged to ask questions (whether individually or as a group) to complete their work. In the face-to-face section, a class day was taken out for each project so that students could divide into groups to begin work on their projects. During that time, the author circulated around the room to address any initial questions or difficulties that these groups encountered.

Glancing at the averages of the peer evaluations of group projects in Spring 2009 indicates that the online section's group evaluations were quite similar to those of the face-to-face section for three of the four projects. The third project shows a marked drop in the online section's group evaluations.

After the semester had concluded, a multi-variable analysis of variance test (MANOVA) was run to determine if there were any differences in the five components of students' grades (homework, quiz, project, test, final exam) between the two sections.

The statistics for the samples are included in the following table. Sample averages are listed above sample standard deviations in last five columns.

Table 1
Spring 2009 averages

		Average (out of 100%)				
Section	**Number**	**Quiz**	**Homework**	**Project**	**Test**	**Final Exam**
Face-to-Face	30	63.67% (23.49%)	81.28% (21.86%)	76.75% (11.65%)	62.53% (14.01%)	60.67% (22.80%)
Online	17	72.79% (23.93%)	83.81% (20.78%)	61.15% (15.53%)	47.73% (22.18%)	48.84% (29.46%)

The test performed on the above statistics yields the following significance levels:

Table 2
Spring 2009 statistical results

	Average				
	Quiz	**Homework**	**Project**	**Test**	**Final Exam**
F	1.613	0.700	15.251	7.886	2.358
p	0.211	0.700	0.000	0.007	0.132

No significant difference arises in the averages for the quiz, homework, or final exam. However, project averages and test averages differed significantly between students in the two sections.

Spring 2011

Student comments for the Spring 2009 sections of the course indicated some concern about the difficulty of the group projects and the time given to take the tests. With these comments and the statistical evidence above, the author sought to improve the success in the online section as well as consistency between the two types of sections. In order to try to address the significant differences in the project averages, project distribution and the interactions in the face-to-face section were mimicked. In particular, for each of the projects, each group was required to meet with the author in the Wimba environment on Blackboard. Wimba is a virtual classroom environment that includes chat features as well as application and file sharing. In this environment, groups were able to gather online during a specified time to begin the project with the author immediately available to answer initial questions. In addition to mimicking the face-to-face environment, enforcing student interaction helps to ensure a broader network of peer support and assurance of instructor availability. These are qualities essential to building student support, an important aspect of increasing the success of students in an online environment (Harrell, 2008).

To address the different test averages, a practice test was placed on MyMathLab five days before the first test. This voluntary test was available to both sections of the Spring 2011 course. The practice test covered assumed knowledge (e.g., decimals, fractions, and proportions) and was meant to show online students the format of what the online test would look like.

Course content remained relatively stable between sections taught in Spring 2009 and Spring 2011. Minor changes included less emphasis on the individual row operations of row reduction of a matrix and a corresponding increase in time at the end of the course spent covering material on measures of central tendency. All other topics remained the same. Numerical values in each of the projects changed as well.

No other changes were made to the structure of the Spring 2011 finite mathematics courses, including the types or weighting of the graded assignments. No students withdrew from either section in Spring 2011, and all students in both sections were undergraduates of typical college age enrolled in other (face-to-face) classes at the university. As seen in the graph below, the Fall 2010 GPAs of the two sections showed no statistical difference.

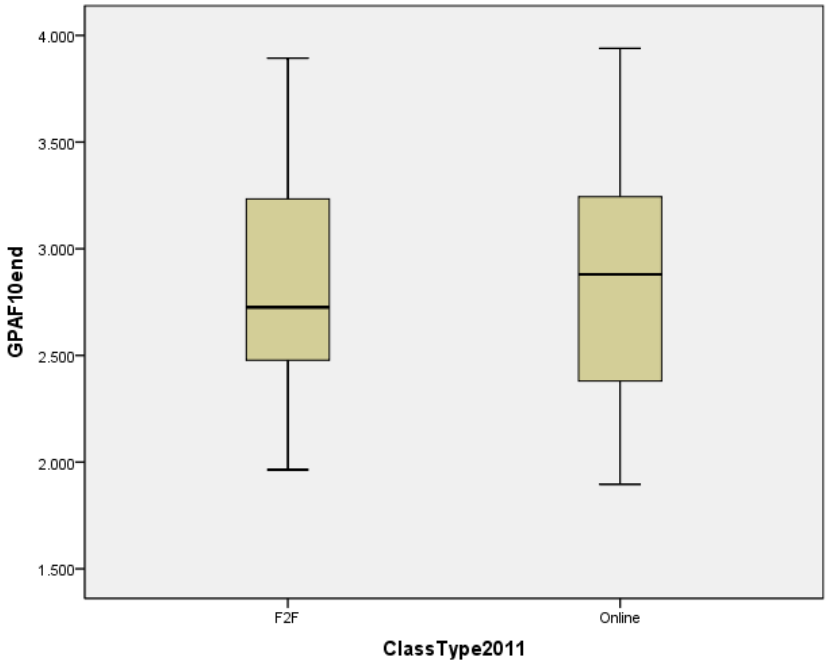

***Figure 2*: Boxplot of fall 2010 GPAs for face-to-face & online spring 2011 sections**

As in Spring 2009, a MANOVA was run after the semester was done, both to evaluate any potential changes in the project and test averages due to changes in the course delivery and to confirm that the averages for the other aspects of the course remained similar. Descriptive statistics for Spring 2011 are displayed below.

Table 3
Spring 2011 averages

		Average (out of 100%)				
Section	**Number**	**Quiz**	**Homework**	**Project**	**Test**	**Final Exam**
Face-to-Face	37	78.39% (19.83%)	90.10% (13.74%)	80.10% (8.80%)	75.30% (11.16%)	74.99% (12.96%)
Online	30	82.96% (22.21%)	88.38% (18.71%)	73.66% (17.57%)	64.38% (14.53%)	61.79% (23.25%)

The MANOVA test yields the following test statistics in Table 4.

Table 4
Spring 2011 statistical results

	Average				
	Quiz	**Homework**	**Project**	**Test**	**Final Exam**
F	0.792	0.187	3.806	12.109	8.638
p	0.377	0.667	0.055	0.001	0.005

Again there is no significant difference in homework or quiz averages from the Spring 2011 sections. A significant difference again arises in the test averages between face-to-face and online sections. At the 5% significance level, the project averages for the two sections were not significantly different, while there is a significant difference between the final exam averages of the two sections.

Project success

One goal was to increase consistency of the outcomes of similar students enrolled in different sections of the same course. Although statistically significant, consistency of group project averages is less convincing from a practical viewpoint. This ambivalence is inconsistent with several previous findings about the success of face-to-face versus online students (Block, Udermann, Felix, Reineke, & Murray, 2008; Dell, Low, & Wilker, 2010; Somenarian, Akkaraju, & Gharbaran, 2010; Wagner, Garippo, & Lovaas, 2011), which show no difference in success.

While the goal of improved consistency in project scores achieved limited success, improvement of the overall project scores of the online section was realized. As stated above, although some small changes were made to the numbers in the projects, their structure and content stayed essentially the same. Templates of the project solutions were not made available to the Spring 2009 students, and these projects were not used in any other sections of the course in the intervening time period. The average GPAs in Fall 2008 and Fall 2010 were not significantly different for students in the, respectively, Spring 2009 and Spring 2011 online sections.

Project averages in the online sections from Spring 2009 and Spring 2011 were compared using the relevant data above, gathered in the following table.

Table
Online project summaries

Section	Number	Project Average	Project Standard Deviation
Online 2009	17	61.15%	15.53%
Online 2011	30	73.66%	17.57%

A 2-sample *t*-test strongly supports the claim that the project average for online students who receive group interaction via Wimba at the beginning of the project is greater than the project average for online students who do not ($t(45)=-2.443$, $p=0.010$). This study shows quantitatively that the enforced interaction had a measurably positive effect on project scores. This method serves as a bridge between the strictly synchronous or strictly asynchronous communication for any particular aspect of a course. Faculty perceive both pros and cons in each technique (Huang & Hsiao, 2012; Williams, Cameron, Morgan, & Wade 2012), while students have been shown to rate instructor presence in a real-time chat environment as less important than many other aspects (Sheridan & Kelly, 2010). This study underscores the value of a method which merges the potential for both methods of communication in a particular assignment.

A small step meant to help success in test averages for online students may or may not have led to a significant increase in those averages. There is strong evidence that the test average for the online students with a sample test is greater than the average of those who did not; however, the increase cannot be attributed solely to the sample test because of the addition of the sample test and the slight change in topics in Spring 2011.

Conclusion

Scores on the group projects were significantly improved in the online section by requiring early synchronous interaction among members of each group (with an instructor available to answer questions), and the difference in average project score between face-to-face and online sections of the course was statistically insignificant with this interaction added to the online section.

As a result, the principal recommendation regarding online facilitation of projects is to employ both synchronous and asynchronous communication techniques even within one type of assignment. Relying on a dual approach allows students to receive immediate feedback to build confidence in their skills, interact directly with peers, and to take advantage of the extended time needed to digest ideas and struggle with concepts on their own schedule. Given that 72% of course projects are the same in undergraduate mathematics courses where sections are offered both face-to-face and online (Blair, Kirkman, & Maxwell, 2013), a different method of implementation for course projects would prove valuable for student success.

The significant difference evidenced in Spring 2009 between the averages of the test scores was not so easily addressed. Several avenues to address the continued differences in test scores between online and face-to-face sections of this course exist. One option is to provide targeted practice exams on the topics to be covered on an upcoming test, instead of simply having a practice test to address the format of an online exam. Another option is to reexamine how online students take an exam to determine the best extended time technique in this setting.

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Editor's Note: It is fascinating to see reflections of our own professional experiences and gain new perspectives through the eyes of another culture. it is important to partake of the author's experience and context. Dr. Nkom has broken new ground to make learning and instructional technologies more relevant to teachers and learners in Nigeria by implementing his expanded communication model and his updated definition of instructional technology.

Instructional Technology: Challenges of the twenty first century

Andrew Nkom
Nigeria

Abstract

The writer had been concerned about seeming inconsistencies and contradictions in the literature in use of concepts in the field of Instructional Technology; a major one being that terms 'Educational Technology' and 'Instructional Technology' can be used interchangeably. An earlier article in this Journal, Jan 2012, 9:1 entitled, "Instructional Communication: Expansion in communication theory", presented a communication model for the twentieth first century that incorporates individualized learning. This served as impetus to address the issue by presenting another view of the field from a developmental or historical perspective and at the same time, take the further step of placing the model within the twenty first century. This article focuses on contributions made through the phases of development that include: Visual Instruction, Audiovisual Instruction, and Educational Technology, with a similar theoretical framework and some defining features in the theoretical framework of Instructional Technology. This article places the Instructional Communication Concept communication model within the focus of instruction in the twenty first century with emphasis on individualized learning in the informal sector using social media. The article identifies challenges of the twenty first century to focus on how to design instruction to take advantage of the ideas of education for the informal sector since the mass media are also in the business of instruction. Instructional Technology has thus attained relevance in the twenty first century in the merger of ideas of education with those of mass communication, and thereby has the potential to improve quality of life of the global community.

Introduction

Current literature in the field of Instructional Technology, within formal education, reveal inconsistencies and contradictions in the use of key terms. Instructional Technology is said to be a sub-set of Educational Technology (AECT: 1977) while it is also said that the two terms can be used interchangeably (Ravazi: 2005). The attempt to define the two terms, by AECT (ibid) does not show clearly discernable differences in features. Indeed, except for differences in their wording, both terms have the common concern in the use and management of technological processes and resources with a common component of application to learning. The term Instructional Technology is used variously to refer to instructional strategies in the same manner that the term Instructional Communication is used (Myers; Simonds: Google search; 2011). However, the term is generally used to refer to devices or equipment as technology of education, as hardware along with software. Schneider (2013) in this regard and as a consequence, having examined the terms 'Educational Technology' and 'Instructional Technology', concluded that there is still debate on what these terms mean.

The debate would not occur if Tickton's (1970) definition, which conceptualized Instructional Technology and provided a theoretical framework for its application, was used to place their location within the developmental context of the field. There is a need to present another view of the field from a developmental and historical perspective, guided by that conceptual framework, to identify concepts that are consistent with the demands of instruction in the twenty first century.

With the current enhanced focus on individualized learning through the social media, it must be conceded that the mass media are in the business of instruction and should therefore benefit from concepts and practices in education as advanced in Instructional Technology.

As part of the contradictions, there is a general tendency to dismiss or disregard well-established concepts and practices in education as being 'old school' or out of date, as has been the case in the field of Instructional Technology. We are now talking of traditional or old methods and teaching strategies have been elevated to the status of methods. It should be instructive for instance, that basic concepts being used in formal education today; school, class, inspection/ accreditation, teacher registration and professionalism, scholarship schemes and endowed chairs, have their origins from Greco-Roman rather than twentieth century education. Similarly, American pragmatic education from the eighteenth century as different from liberal education in England, had its origins from Spartan education and set the pattern such that as observed by Niblett (1974; 24), the major effort of the twentieth century was to develop more universities of a technological kind and to emphasize within existing universities the parts which were likely to be of use to society in a fairly immediate sense. Its organization originated from the work of Andrew Bell in India, which was developed further by Joseph Lancaster to become the Lancasterian Method, which broke instruction into separate classroom packages and presented them in a modular form with each unit completed before the next could be learned. The method was adopted in the United States of America at independence, as the key to large-scale education on a minimum budget (Brauner: 1964) and is now employed generally in the modular approach to instruction. Therefore, the concept of Instructional Technology constitutes a summation of those old school findings from research and experience over the centuries relevant to promoting more effective learning through effective instruction.

Concept of instruction

The concept of instruction is basic to the appreciation of the term 'Instructional Technology'. The term, 'instruction', is used in this context as an umbrella concept in formal education covering its three broad modes or methods. As shown by Finn 1961 (in AECT;1977), these modes of instruction include; the lecture for large group instruction, teaching for small group instruction and individual or self-instruction in which, the individual proceeds to learn at his/her own pace and convenience. Strategies accompany methods and are used for specific and different learning outcomes across these modes of instruction such as; demonstration, discovery, project, discussion, fieldwork and educational visit, which relate to learning of specific skills.

Demonstration for instance is the exhibition of skills in the psychomotor domain on how a particular thing is done or has been done; a 'do it yourself' approach to instruction, as guidance for the individual learner to emulate, just as discussion has to do with shaping perception by sharing information, feelings and attitudes. Project can be used for developing skills in the three domains of learning such as to do with mental processes, feelings and attitudes and physical skills. Whereas modes or methods are generalized, well-organized and planned ways of instruction, strategies are outcome-specific in a support role. Indeed, discovery rather than being seen in the restricted sense of a strategy, marks that moment of perception often accompanied with the exclamation 'Oh, I see!', when whatever is perceived is stored as learning.

Programmed instruction had gone into hibernation with the failure of the teaching machine until the late twentieth century when its variant, computer-aided instruction, revived the concept. Technology was a supplement to materials, gadgets and equipment in formal classroom instruction, to cover teaching in small group instruction, and the lecture for large group instruction of the medieval university tradition (Daly: 1961).

Perhaps a singular contribution that Instructional Technology has made to education is that it has more correctly re-aligned the field in the stress on and use of the term 'instruction' as indicating the raison d'être of education. Rather than being a sub-set (AECT: 1977), instruction gave birth to content in the different fields, disciplines and subjects which have witnessed a steady growth over the centuries, as well as to methods and their accompanying strategies, where distance learning refers to a mode of delivery in the formal sector. It was the concern to develop knowledge, skills and acceptable attitudes from the earliest of times of formal education that determined; what to teach, who to teach it to, and how to teach it. Indeed, according to Boyd (1969), training and instruction of the young for the business of life is one of the most ancient concerns of mankind.

Phases of development to instructional technology

A common preoccupation of formal education over the centuries has been on how to bring about effective learning which, however, is dependent on effective teaching, where 'teaching' is used to cover the process of inducing learning towards acquiring an education, in confirmation of which, certificates, diplomas, degrees and other attainments are awarded. In talking about phases or stages of this development, demarcations are to do with similarities in theoretical outlook in the integration of relevant materials into instruction as were available. The phases in terms of formal integration of materials, devices and gadgets into classroom instruction, formed steps on which subsequent broad phases including; Visual, Audiovisual and Educational Technology were improvements, leading to this current systems approach of Instructional Technology phase.

Visual/Audiovisual instruction phase

The use of material things to aid instruction dates back to the Greco-Roman period. Quintilian (35-95 A.D.) described as a professional and most successful teacher of his time, was said to have used as visual aids, alphabets in both biscuits and pictures (Ulich: 1969). The incorporation of materials into regular classroom instruction is said to have occurred in the 1920s (AECT, 1977) where visual materials such as illustrations, charts, models, and real objects were used in order to provide concrete visual experience for learners. The term 'visual instruction' thus referred to the use of such materials in regular classroom instruction. The invention of the Gutenberg printing press marked a most important technological development for instruction in enabling the printing of a variety of visual materials.

Audiovisual instruction emerged out of specifically, audio technology, enabling the recording of voice, allowing the addition of an audio channel to visual materials. The term 'audiovisual instruction' therefore referred to the use of a variety of devices to transmit ideas through the eye and the ear with emphasis on the value of concrete and non-visual experience. However, the vision of learning that marked out this phase was that of a continuum from the abstract to the concrete as illustrated by Dale's cone of experience (AECT: 1977). Programmed instruction which was part of this phase, benefitted from the work of Associative theorists; Thorndike, Pavlov, Guthrie, Hull and especially that of Skinner in his theory of Operant Conditioning (Ulich: 1968). The Stimulus-Response (S-R) theory by which a stimulus attracts a response, buoyed by developments in technology, led to the vision that a teaching machine could be developed that could replace the teacher in what was called programmed instruction. The new technology; the teaching machine and programmed instruction, were eulogized in publications of the mid-twentieth century (Galanter: 1959, Goldsmith: 1963, Leith: 1964 and DeCecco: 1964). The basis for programmed instruction in the S-R approach was the use of the theory to the effect that the teaching machine would provide stimulus to which the learner would respond.

Educational Technology phase

The vision of the teaching machine replacing the teacher in classroom instruction (Goldsmith, 1963:192) did not work, but its technology orientation endured in the concept of Educational

Technology. The concept of Educational Technology and the first use of the term is said to have begun in the early 1920s while it was also said to be a young field of study by 1968 (AECT: 1977). The said first use of the term, in coinciding with the formal use of visual materials in classroom instruction in 1920s, could only have referred to the use of technology in education, which also applied to the use of visual and audiovisual materials. Having been adapted from mass communication technology, the use of the term 'Educational Technology' was to indicate or isolate their use for educational purposes in instruction as different from mass communication as was confirmed by the observation (AECT, 1977:3); that "Instructional Technology is a sub-set of Educational Technology, based on the concept that instruction is a sub-set of education".

The term 'Educational Technology' does not appear to have been based on any independent theoretical framework or concept other that of the earlier phase of audiovisual instruction in the use of a variety of devices to transmit ideas and provide concrete experience through the eye and the ear. However, this phase saw the introduction of innovations into instruction. The use of the different devices or equipment systems in regular classroom instruction, for instance, brought about the development of communication theories to explain the nature of communication, which changed orientation from emphasis on equipment or things to emphasis on process (AECT, 1977); thus the use of the term 'resources' to include along with the equipment, personnel and physical facilities (Brown, Lewis, and Harcleroad, 1977). The concern for physical facilities brought about focus on their provision for the effective use of equipment and thus gave birth to the field of Educational Facilities Design based on the realization that the proper use of such devices must start from the design stage of instructional buildings because of the need to accommodate technology, to cover such issues as: space relationships; specialized facilities such as lecture theatres, laboratories and studios; shapes of buildings such as to do with seating and sight-lines; front and rear projection systems; as well as lighting, acoustics and thermal environments (Flynn: 1970; McVey: 1971; McVey: 1975; and Sleeman, P. J., Cobun, T. C., and Rockwell, D. M.: 1979).

Another major development at this phase was the division of the field into two main functions; that of an academic discipline and of providing instructional support services. Academic programmes identified by various names such as in Educational Media and Technology, were introduced to cover the instructional process in terms of issues related to the effective implementation of instruction using technology. Support services were provided by Media Centres or Centres for Educational Technology as they were known in Nigeria, for the purposes of production, acquisition and circulation of equipment and materials to support classroom instruction. The failure of the teaching machine project and the development in the field that established its dual functions, thus served to more firmly place the teacher in formal classroom instruction and to thereby place technology back in a teacher-support role.

The introduction of the computer into classroom instruction was a defining milestone that, starting from its use in what was called Computer-Assisted Instruction (CAI), revived programmed instruction and shifted the character of instruction towards individualized learning. Educational Technology however, essentially saw the use of the same technology as in the audiovisual phase; different types of projectors along with appropriate projection screens, audio and video recorder/players and record players as hardware, with films/filmstrips, transparencies, slides, reel-reel audio and video tapes, audio/video compact discs and records as software.

Instructional Technology phase

This phase of development which benefitted from earlier phases has, perhaps on that account, particularly shown inconsistencies and some level of contradiction in the various applications of terms in this field. Instructional Technology has a theoretical framework, which is to bring about more effective learning, as articulated by Tickton (1970). Towards that end, Instructional Technology depends on or employs relevant output from research in human learning and

communications and in the use of both human and non-human resources to cover the whole instructional process as a system. In this sense, the discipline of Instructional Technology represents a summation of such outcomes over the centuries that are relevant, to bring about more effective learning through more effective instruction. Technological development resulted in miniaturization in micro-chip technology, which allowed the replacement of the different bulky and expensive hardware formats with inexpensive compact technology with prominence given to software in programming, thus setting the grounds for the phenomenon of individualized e-learning of the twenty first century.

Instructional Technology: Instruction as a science

Since from early in the twentieth century, instruction or pedagogy had been regarded as a science. Jude 1912 (in Bruner, 1964: 125) had postulated that a science of education was almost as overwhelming as a science of all life or a science of social institutions and that any attempt to understand such an expanse of social activity and individual behaviour involving at least two of society's major social institutions, the school and the home, which did not draw on the full spectrum of available specialties, he considered virtually useless. It was on that basis that Cameron (in Brauner, ibid: 137) observed that experimental pedagogy relied upon the results of all the sciences whose facts had significance for education but in borrowing from all such fields, regarded such results from the point of view of education. Thus evolved the general field of Educational Foundations covering such disciplines as; foundations of education, philosophy of education, educational psychology, sociology of education, comparative education, educational economics and educational facilities with immense benefits to instruction. Specific to learning theories from the field of Psychology, these coalesced in the twentieth century (Nkom: 2000; 15) into the Associative group (Thorndike, Pavlov, Guthrie, Hull, Skinner) and the Cognitive group (Kohler, Lewin, Tolman, Gestalt). Both groups of theories have made contributions to instruction that have become relevant to the demands of instruction from the Instructional Technology perspective, particularly in the twenty first century.

Instructional Technology: Instruction as a system

As part of its nature as a science, instruction is a system. As a concept, a system is made up of components which operate in integration to achieve the system efficiency. It is a dynamic and continuous process with all components interacting with each other and affecting each other (AECT, 1977). Brown, Lewis and Harcleroad (1977) in the Systematic Approach of Instructional Technology communication model, have shown this systematic and scientific approach of Instructional Technology as consisting of four components; Goals, Conditions, Resources and Outcomes with eight sub-components. Nkom (2012: 58) in the communication flow component of the Instructional Communication Concept communication model has included Perception and Implementation to bring the components to six.

Cognitive theories have shown, in the components of the systems approach, that the human brain processes information on the basis of information already available to it (Sotto: 1994:73) or what it had previously stored; thus the need to identify previous knowledge as entry behaviour. Similarly, Mager, Gagne, Bloom and Glaser (Wikipedia: Retrieved, May, 2013) have shown the importance of drawing up useful objectives in relation to the Domains of Learning as well as criterion as an aspect of measurement which, used with objectives, gives indication of expected level of perfection. Carrying out instruction requires suitable physical spaces properly fitted for each purpose, as well as relevant personnel, equipment and instructional resources. There is logical progression in implementation with a conclusion that brings together the bits as steps or skills into which the materials had been presented and summary to bring out the essential contents. Other components help to firm up learning. When these components are handled properly in the systems approach starting from perception on the part of the teacher, this would

lead to effective communication to result in perception in the individual learner as a pre-condition for learning to occur.

Communication in Instructional Technology

Communication is central to instruction because instruction is a communication event. Communication has therefore been of central concern in instruction from the earliest times of formal education and has been a recurrent theme in the concern for effective learning (Bigge: 1976; Eble: 1976; Curzon: 1990; Sotto: 1994). As early as about the fourth century, St. Augustine (354-430 AD) had identified the type of communication that became known as Intrapersonal Communication in the twentieth century (Curtis and Boultwood: 1965). In coming to the realization that what is known to us is known through the senses of the body and the experience of life, he came to the logical conclusion that learning is individual and therefore that it is impossible for the teacher to impart knowledge. It is on this basis that learning theories in the twentieth century have identified the role of a teacher as that of a facilitator. In the use of the impersonal source-destination communication process, with noise restricted only to the transmission channel, twentieth century communication theories were not in consonance with the basic requirements for effective communication in instruction (Nkom: 2012).

Goldsmith (1963) had seen the history of the development of educational techniques as a process of progressive improvement of the means of communication between teacher and pupil. The earlier phases had been concerned with the means of communication in terms of things, gadgets and equipment. Instructional Technology is concerned about not just the means, but especially the effectiveness of that communication and therefore requires a communication theoretical framework that is in line with these concerns. Based on the model that has provided that framework, the concern for effectiveness of communication has been illustrated in teacher education in Nigeria by the publication of the Instructional Communication for Effective Teaching series covering the Nigerian educational ladder and the development of the Professional Diploma in Education (PDE) programme with eight areas of specialization (Nkom: 1999a; 1999b; 1999c; 2000; and 2008). The model has been recognized as a useful expansion of communication models of the twentieth century to incorporate individualized learning (Perrin, in Nkom: 2012) and is therefore suited as forming the communication theoretical framework for instruction in the twenty first century. In that sense, the model has taken Instructional Technology into and made it relevant to the twenty first century.

Conclusion

The influence of e-tools has encouraged the growth of informal learning through a person's life-time such that the challenge is for instructional designers in the twenty first century, to create learning opportunities that may occur anywhere and anytime (Wikipedia: Retrieved, May, 2013). The phenomenon of the twenty first century is therefore the shift to individualized instruction or self-instruction that has gone beyond formal education to have more focus on the informal sector through the use of social media. The concern currently is on how to develop instructional programming for individualized instruction through the use of social media. The current phase of Instructional Technology has provided education components for the design of individualized instructional materials to promote individualized learning that can be used with the mass media generally so as to create learning opportunities that may occur anywhere and anytime in both the formal and informal sectors.

Individualized learning has benefitted from contributions, from the education perspective, that have pointed the way to preparing materials such that effective learning can occur anywhere and anytime. Skinner (1958) through his work in programmed learning based on behaviorism theories, provided the relevant initial steps in the design of programmed instruction, which

basically e-learning is, to include; behavioral objectives, small frames of instruction, self-pacing, active learner response in questions and immediate feedback. Finn (1961, in AECT: 1977) identified individual or self-instruction as a separate mode of instruction, thus allowing for its development to cover both formal and informal sectors, along with the lecture for large group and teaching for small group instruction. Tickton (1970) provided the operational theoretical framework for Instructional Technology in its concern for more effective learning. Nkom (2012) provided its communication theoretical framework based on cognitive theories, as a personal process extending from the perception of the teacher to that of each individual learner and Brown, Lewis and Harcleroad (1977) and Nkom (ibid) have codified the systems approach.

Instructional Technology, in order to promote effective learning in the twenty first century, must operate as forming a merger of ideas of mass communication with those of education to properly cover all the three modes of instruction to include the informal sector. The mass communication media which are in the business of instruction in their use of social media need to take advantage of and use education theories, principles and practices as contained in Instructional Technology in the design of their programmes. Essentially, both fields are in the business of instruction in the current age that is dependent on communication as a means for improving the quality of human life globally. Instructional Technology, through both formal and informal instruction in the use of both regular and e-media formats of mass communication, is in the position to provide the means for promoting global efforts directed at improving the quality of life of the global community.

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Dr. Andrew A. Nkom from Kaduna State, Nigeria, currently at Nasarawa State University, Keffi, Nigeria, earned professional teacher qualification, Nigeria Certificate in Education (NCE) with Distinction in English in 1966. He holds Bachelor of Arts (Second Upper Honours) degree in English in 1970 from Ahmadu Bello University, Zaria; a Master of Arts degree in Mass Communication in 1980 from Emerson College, Boston, U.S.A. majoring in Television Production and Public Relations and a Doctor of Education (Ed.D) degree in Educational Media and Technology with Special Interest in Educational Facilities Design in 1982, from Boston University, Boston USA.

His most outstanding contributions have been in teacher education where he has served his working career almost exclusively. He developed the Instructional Communication Concept (TCC) communication model, which provided the communication theoretical framework upon which he developed the Professional Diploma in Education (PDE) programme with eight specialization areas with a support manual and has published the Instructional Communication for Effective Teaching series covering the Nigerian educational ladder. The communication model was adjudged as a useful expansion of communication theories of the twentieth century to incorporate individualized learning, by International Journal of Instructional Technology and Distance Learning, Vol. 9 No 1. Jan 2012.

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Editor's Note: When live classes are translated into media for distance learning, it enables evaluation of each component to determine if and how well it is achieving its desired purpose. This study records the success of the first iteration and makes suggestions for further improvement.

Virtual classroom modules: an effective tool for qualitative learning

Sunanda A. More
India

Abstract

Quality of teaching and learning is a major concern today in both conventional and Open and Distance Learning (ODL) systems in India. The total quality of the ODL System depends on various components and services offered to the learners. Face-to-face counselling is one major component that contributes to the quality of the teaching and learning of the academic programme offered in the ODL System. Quality improvement in face-to-face counselling and learning gains at study centres in the ODL System can be achieved in various ways by methods and by making effective and economical use of multimedia or e-learning tools.

A case study was undertaken on the learner's at three study centres of Engineering Programmes of YCMOU, Nashik of India. This study was focused on the part of learning with media i.e. Virtual Classroom Module. The research findings are helpful to improve our present system of teaching and learning with media. It provides valuable insight for policy makers, designers and developers to explore appropriate methods for counselling to enrich teaching and learning in ODL System of the future.

Keywords: counselling, VCM, ODL, e-learning, teaching-learning, YCMOU, multimedia, basic electronics, quality, effectiveness

Introduction

In India, the Open and Distance Learning (ODL) system is established to cater the needs of a large sector of society. It provides learning opportunities to large population at various levels including those who do not have access to traditional education for various reasons such as age, affordability, access, break-in-education, rigid structures and rules, job, family responsibility, time restriction, etc. But education is important for personal and professional growth and therefore in national development. The distance education system is designed to be flexible and learner oriented and is capable of providing quality education and support services directly to the learner at a distance. Even today, limited academic inputs and supports are given to the students at their study centres by the counsellors. The counsellor is a multifaceted person who bridges the gap between the learners and the system, motivate them for self-study, provide guidance for end examination, solve their academic and other problems, and build courage and confidence. This human support is essential to ODL like a teacher in a conventional system. It is observed that along with the self-study, face-to-face counselling is the most important factor in imparting education through distance education system.

Becayse success of the distance education depends so much on the counsellor and his job, better quality counselling helps the student not only during his/her course of study but even in his future career. The role of counsellor and counselling is of prime important and cannot to be ignored. But how do you improve the quality of face-to-face counselling at the study centres? What are the ways and methods? What media can be used to effectively and economically improve overall performance? In this study, the researcher tried to find out answer for these questions.

About e-Learning

The term e-Learning has become a buzz word in our society. e-Learning is the systematic use of communications technology and network information in the process of learning and teaching. Learning with and by the electronic media is e-Learning. Also, it refers to synchronous as well as asynchronous learning across the space, time and pace. Basically, the e-Learning environment is designed truly for the learner, keeping in view the "learner's autonomy". E-learning aims for more "active" learning, where each student can learn at his own pace and time. Various media are used to stimulate active participation in discussions and interactions among the students.

A multimedia learning package developed in Visual Basic, called as Virtual Classroom Module (VCM) is the e-learning tool used in this study. This case study was carried out on students enrolled in the *Basic Electronics* course in the "Electronics Engineering Programme (ESEP)" at Yashwantrao Chavan Maharashtra Open University (YCMOU) Nashik of Maharashtra State of India.

e-Learning Tools

Today many high-tech and sophisticated e-learning tools are designed and developed to make teaching and learning more effective and efficient. These tools, used to support counsellors for better counselling, include the e-mail communication centre, chat room, discussion board, news board, conferencing, threaded discussion forum, self-test centre, on-line counselling centre, student support services forum, virtual classroom, and MOOC.

Institutes can plan e-Learning activities for imparting education to their students as suggested by French, Hale, Johnson, & Farr (1999). e-Learning can effectively support a self-directed and student-centred learning environment.

What is a virtual classroom?

Virtual learning as described by French, Hale, Johnson, & Farr (1999) refers to the process of learning and teaching via the Internet and electronic media such as CDROM without any face-to-face contact between and among the participants. In this mode, Internet and/or Electronic Media replace conventional lectures, creating new opportunities for self-directed and flexible learning. Within technological limitations like bandwidth, internet accessibility, cost effectiveness, etc, the School of Science and Technology of YCMOU Nashik, Maharashtra State of India designed a virtual classroom to meet and satisfy the needs of most students and educators. A conventional classroom situation for a single topic is the basis for virtual lessons called "Virtual Classroom Modules (VCM)".

According to the School of Science and Technology; Virtual Classroom Modules are described as "well-prepared high quality lectures from master trainers with multimedia presentation in colour". VCMs combine distance education instructional pedagogy with latest interactive multimedia Internet technology. VCMs help the counsellor to efficiently perform his basic job of providing information in less time without compromising quality. Time saved can be utilized to develop higher-level mental abilities like comprehension, application, analysis etc. The VCMs are developed by a specified procedure in a format designed and described by the School. Finally, CDs recorded by master trainers are provided to students to enhance and enrich learning in the distance education mode.

In VCM development, the use of video is kept to the minimum possible level and is normally restricted to imparting skills. Hence, VCM production is easy, fast and of good quality. Discussion and/or tutorials with a live counsellor and fellow students follow the lecture at each study centre. Here the role of counsellor changes to facilitator.

For this case study, based on the guidelines framed by the School, a VCM created with the Visual Basic authoring tool was developed for the topic "Diode Applications as Rectifiers" for the course 'Basic Electronics'. This topic was selected by an exhaustive process.

Objectives

The objective of this case study is to test effectiveness of teaching and learning with the help of the VCM "Diode Applications: Rectifiers.

It was assumed that a Virtual Classroom Module (VCM) developed for this topic would enable learners to understand theory and practical activities related to Rectifiers.

VCM Development Process

1) Selection of content for VCM

International Standard norms were followed to develop this VCM for the content "Diode Applications: Rectifiers." Accordingly the content selected for VCM was analysed; classified the topics for the theory and for practical. This VCM covers following content.

Main Topics of VCM

1. Introduction
    - 1.1 About Diode
    - 1.2 Need of Rectification
    - 1.3 Diode as a Rectifier
    - 1.4 Electrical Characteristics of Si Rectifier
    - 1.5 Types of Rectifiers
2. Theory
    - 2.1 Half- Wave Rectifier
    - 2.2 Transformer-Fed Full-Wave Rectifier
    - 2.3 Bridge Rectifier
3. Laboratory Experiments
    - 3.1 Half-Wave Rectifier
    - 3.2 Bridge Rectifier
4. Summary
5. Key Terms
6. Self-Test
7. References

The whole VCM is recapitulated in Summary to enforce what the learner has undergone previously. e-Learning content is developed for non-linear learning. With the navigational controls used in the VCM, the learners used to move around any topic covered in the CD-ROM. Hence well-defined Key Terms used in this product help the learners while studying the content.

2) Selection of media

Researcher prepared all circuit diagrams, graphs, video clip, tables and graphics. Similar exercise is done for the laboratory experiments meticulously. All the required circuit diagrams, graphs, charts, tables, input and output waveforms are drawn by the researcher with the help of 'Microsoft Power Point' on the computer to use as and when required.

3) Selection of authoring tool

Among the various authoring tools researcher selected Visual Basic 6 (VB6) Programming Language to develop the content of this product in presentable form since it offers extensive teaching capabilities. With this tool, a windows based application is quickly and easily designed. VB6 provides a graphical environment in which developer visually designs forms and controls of the applications, compatible for the web-based applications with many useful support tools. Applications developed in a programming language execute quickly even on minimal computer platforms and software cost tends to be low.

4) Presentation strategy

Researchers prepare the user interface for each screen to reduce the learning time and to enhance the efficiency of the user. Screen design, position for buttons, text, font, size, colour, and background parameters are determined mostly by International Norms.

5) Actual programming and screen design

Screen design is an integral part of all instructional e-Learning applications. Attention to the elements on the screen can often determine the success or failure of such kind of product. Peter Fenrich (1997) rightly says, "Instructional e-Learning technology offers the potential to teach in ways that can not be done with the traditional methods." To ensure the sequence of the screens appearing on the screen and to prevent the wasted effort, researcher planned all the screen design in advance with following specifications for many screen characteristics.

Screen size, Colour palette
Locations for screen components
Specific colour choice and appearances of screen components
Fonts and sizes for screen components
Sizes of video images and graphics
Menu designs, Icons and text matter
Availability of utilities (Glossary, calculator, etc)
Methods of accessing control options
Methods for entering inputs

With this planning, inputs and content, the researcher developed this user-friendly product in Visual Basic 6 programming language with ultimate simplicity and clarity to increase motivation, improve attitudes, and reduce fears.

Research methodology, sample and tools

This research study was designed for Quasi-Experimental Design methodology. Content Pre-test and Post-test is used to collect the data. The sampling method selected about 30 students for testing from the Nashik Region enrolled at semester 4 of the Electronics Engineering Diploma Program and studying Basic Electronics-1 Course. This data was analyzed using Basic Statistics techniques.

The researcher supplied the following material and used tools to observe teaching and learning with VCM:

Pre-Test Questionnaires
Post-Test Questionnaires
Product: CD-ROM
Installation Instructions

The listed activities were carried out at all study centres/ institutes.

The awareness level about the subject matter was tested during the Pre-test.

After a gap of nearly 21 days, respondents completed the VCM developed on the computer.

A post-test provided feedback on how well each learner acquired content from the VCM.

Analysis and interpretation of data

Data was collected through the Pre-Test and Post-Test questionnaire. Respondents were asked to check the most correct option box or write in where a line is present. The purpose of feedback was to measure knowledge understanding about Diode Applications as a Rectifier before and after learning from the VCM. The format of questionnaire was as shown in the Table 1.

Table 1
Format of questionnaire

Type of Questions	Respondent Students Questions
General Questions	6
Awareness/Content-based Questions (Pre and Post-Test)	18
Quality of Product	4
Total	28 Nos.

Then the analysis of each data was interpreted wherever it was necessary.

Classification according to general Information

From the sample data, it was seen that 86% sample respondent students were in the age group 15-22 years and only14% sample respondent students were in the age group 23-29 years. This indicates that for this Engineering Diploma Programme, young and fresh students below the age 22 years take admission. Among them, about 52% respondent students were H.S.C. category and 31% were from I.T.I./other Diploma category, whereas only 17% respondents were from S.S.C. category. It was also observed that employed students are 25% and unemployed students are 75% of the total respondents. Within the respondents, 33% students were from rural area whereas 67% were from urban areas. About 64% respondents had access to computers but 26% respondents did not have access.

Posttest feedback analysis

Posttest feedback analysis was important to examine the increase in the knowledge of respondent students after completing the study using VCM on the computer system. The total of 36 responses for the Pre- and Posttest were analysed. The feedback data showed the effectiveness of the product developed. The mean of pre-test and post-test scores for all students was calculated to average out the responses. Thereafter, standard deviation of both scores for all respondent students was calculated to determine the maximum variation in the score of the respondent students in pre and post-test. T-test was applied to analyse the Pre and Post Test feedback.

This data is tabulated as follows.

Table 2
Pre and post-test responses of all respondents

Status	Pre-test Score	Post-test Score
No of Respondents (N)	36	36
Mean of score (M)	5.0555(M1)	13.888(M2)
Difference between Means (DM)	8.833	
Mean Percentage	14%	38.58%
Standard Deviation (σ)	3.079(σ1)	3.049(σ2)
Standard Errors of Mean (σM = σ/M)	0.60 (σM1)	0.22 (σM2)
Correlated Mean (r12)	0.3931 (Pearson)	
Significance of difference between Correlated Means (SED)	0.5526	
T test (DM/SED)	15.98 ≅ 16	

Pretest: It revealed that about 14% of respondent students had knowledge about the topic Diode Applications and Rectifiers before the dissemination of Virtual Classroom Module developed.

Posttest: This data revealed that the mean value of the correct responses received in Post-Test was more than the mean value of the correct responses received in Pre-Test. This post-test mean value was 34.58%. The difference between the pre and post-test mean score is 24.58%. This indicates that the correct responses obtained in the Post-Test have 24.58% higher value as compared to the Pre-Test responses of respondent students. It is clearly visible from this the knowledge level of the respondent students was enhanced according to the Post-Test.

Standard T-test was used to analyse and compare both the scores received in the Pre and Post-test by the respondent students. Further calculations are described in the Table. The critical ratio of T-test calculated was 16, which is most significant value.

Qualitative Feedback about the Product by the Respondent

In the Post-Test, 4 questions were asked to judge the quality of the product. The data collected was classified and analysed and the following conclusions were observed.

1. Out of 36 respondents, 50% were of opinion that the more than 75% content presented in this VCM was well understood. Only 3% of respondents could not understand the content presented in this VCM. This data helped the researcher to estimate how much content the respondent students easily understands with this Virtual Classroom Module (VCM).
2. From the total, 52% of respondents were of opinion that they could perform experiments on rectifiers without the help of instructor and with the help of this VCM in the range more than 50% and but less than 75%. About 30% respondents could perform experiments on rectifiers more than 75% without the help of instructor and with the help of this VCM. Only 6% respondents could not perform the experiments with the help of this VCM. This clearly shows that respondent students built their confidence level to perform the experiments independently without help of the instructor at their study centre using the Virtual Classroom Module.

3. From the total, 58% respondents had a productive learning experience with this CD-ROM, in the range more than 50% and but less than 75%. This assured the quality of CD-ROM and VCM were of high quality. Out of the total, 25% of respondents achieved more than 75%with the CD-ROM on rectifiers. Only 6% of respondents did not learn from the CD-ROM.
4. The content of this VCM was well understood due to use of following.
    1) Graphs, Charts, Visual graphics
    2) Simple and clear language and sufficient content depth
    3) Focus on important points
    4) Logical presentation of the content
    5) Wide coverage with theory and practical content
    6) Use of Self-Test and its feedback mechanism
    7) Repeatability

Summary

This case study proved that respondent students very well received the Virtual Classroom Module (VCM) developed for the content Diode Applications as Rectifiers. This rise in knowledge level is 24.58% higher than the previous level. This shows that respondent students understood the content of Diode Applications as Rectifiers. The data interpretation table mentioned earlier supports this. It is further experienced that the respondent students expressed their true and genuine views about the subject matter. However it is worthy of note that the present investigation is limited to extending of awareness level only. General, social, educational and other background of the respondent students contribute in a large extent to understand the subject matter (message) communicated. It is also observed that the VCM developed in the form of CD-ROM was found to be useful and effective, thereby fulfilling the purpose of creation. Learning with VCM was really qualitative and effective for the content developed by the researcher.

Scope and Limitations of Research Problem

The VCMs developed for this course will be useful to all students enrolled for the Engineering Diplomas of any disciplines in Conventional as well as in Open and Distance Education System, H.S.C. (MCVC) in related disciplines. The application of this VCM is wide, but this VCM can be presented in much more user friendly manner by using different authoring tools and media. A comparative study of various media should be conducted to explore the ideal authoring tool for the development.

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Editor's Note: Digital technologies have brought about revolutionary changes in libraries and substantially changed the scope of services and the role of librarians and their clients.

Developing library knowledge services by e-learning

Chi-Shu Tseng
Taiwan

Abstract

In the digital era, because of the impact of digital media, the role of libraries as information disseminator has changed. Physical walls of the library for book-storage have been replaced by a virtual collection. e-Learning is ranging information technology applications to education and is considered as a tools for empowering knowledge. Library professionals need to understand e-Learning to provide effective library services at a distance, because learners may be located anywhere, comprising any age and gender. In the library, knowledge production and consumption can be connected with the circulation of knowledge by e-learning to form a knowledge service chain. This paper intends to introduce knowledge management and e-learning to redefine knowledge service of libraries. At the end, there are two examples to show the content of library paperless learning service models.

Keywords: e-learning, information service, web-based education, library role, knowledge service, knowledge managers, knowledge production, knowledge consumption, paperless learning.

Foreword

Some have forecast that printed books will be totally replaced by electronic books by the year 2018 (Wang, 2005). This forecast suggests that the digital reading trend will usher in new ways of learning. As sources of digital information become more mature, diverse environments, net publishing, online libraries, eBooks, Web2.0 and knowledge management will become essential for libraries providing value added e-learning services. In general, data compression can be used for digital information. Storage capacities are also immense. Links can be made to other video, audio, images and text to make its content richer and more diverse than print media. However, these changes to reading functions will no doubt provide new experiences for readers and change the conventional knowledge formation processes.

Literature review

Digital content and new reading experience

The invention of printing makes fast dissemination possible for human knowledge, while the establishment of libraries allows knowledge to be accumulated, shared, utilized and reproduced. The ways by which knowledge is disseminated have been greatly diversified by the emergence of digital content. With the launch of the electronic book, the new carrier, not to be limited by static contents printed on paper, but with dynamic combination of internet and multimedia, has brought traditional reading experience with paper as well as modes of study to a brand-new level that will revolutionize the process of knowledge formation that we are familiar with. Recent studies show that more than 93% of information is created in electronic formats. The development of digital content, as well as its tremendous amount, has attracted much attention (Wei, 2006). Still, digital content together with the power of on-line searching and retrieval allow quick and easy access to collections among major libraries as convenient as if they are next door, even though they are located in far-flung realms.

Changes brought by digital content include the following:

First, the ways to compile and interpret knowledge are quite different from they used to be. Second, learning resources carried by digital media have caused many changes to library services when compared with those carried by traditional printed media. Traditional collections of libraries in paper formats will have to be provided to readers the way they are, word by word, line by line and chapter by chapter, without the possibility of being presented in other ways. Free from the limitation of paper format, customized presentation is now possible. The mint new reading experience provided to readers pave the way for digital learning.

e-Learning and libraries·

e-Learning includes a wide set of applications such as web based learning and computer based learning. It refers to learning and supportive resources that are available through computers and computer networks. E-Learning is developed to apply information technology applications to education and is considered as tools of empowering knowledge and skills (Vatnal et al., 2004). However, recent development of the new generation of digital learning system has adopted a knowledge-based concept allowing multiple learners to share and exchange knowledge via various digital channels, making learning diffusion effective (Zheng, 2008).

Based on the development trend described above, the library is hard pressed to promote knowledge-based learning. In the environment of digital learning, the roles of libraries may include hi-tech facility providers, exchange hubs for digital content sharing, and promoters of digital learning. Digital content is the must-have for digital learning. Current knowledge-based digital content includes electronic periodicals, electronic books, and electronic encyclopedias and electronic databases. All are provided mainly through libraries (Chen, 2004). As a library, the niche with innovative development in future green life would be to integrate the resources and content of digital learning, conduct knowledge management, provide knowledge exchange channels, and stimulate diversified knowledge power in a paper-free learning environment.

In the e-Learning process, libraries will emerge as an active bridge between the learners and information. Library professionals need to understand the concepts of e-Learning and provide effective distance library services. Learners are located anywhere, of any age and any gender (Vatnal et al., 2004).

e-Learning and knowledge managers

Knowledge is the vital capital for all development in the age of knowledge-based economy. Knowledge management is important to share the knowledge and retrieve it for effective use. With its long-term role of collecting, storing and disseminating information conveyed by books and providing services to readers, libraries' new mission would be to extend information management to knowledge management and transform knowledge into productivity. Libraries shall perform the role of providing knowledge service, assisting readers in searching useful information, and converting it into useful knowledge (Chen &Pan, 2003). Hence, librarians shall take on new responsibilities of mediating knowledge, guiding information, and bridging people and information (Davenport &Prusak, 1999). The library and information professional will have to be closely associated with networks and also be contributing information to a network or a number of networks.

Application of e-Learning to the libraries will be treated by many the libraries as a threat to them and their profession. But, to the contrary, it is not the end of the profession but widening the profession. Traditional knowledge organization techniques such as classification and cataloguing may no longer be effective and useful for dissemination of information, but on the other hand, libraries are in track with latest developments and applications of information technology skills

are growing in importance. Hence, it is necessary for library and information professionals to reorient their skills (Vatnal et al., 2004).

Defining library services from a digital learning perspective

Library professional services and knowledge management processes are similar. Work including acquisition, organization and circulation that use e-learning research content is very closely linked to knowledge management. The timely provision of digital study tools, knowledge and services at different knowledge management stages can promote e-learning activity development and enable knowledge conversion and creation thereby become a knowledge asset and competitive advantage for libraries (Chen, 2006).Thus, digital learning will become a useful instrument to libraries as long as the expertise of knowledge management can be brought into full play by organizing, rearranging, analyzing, and transforming collection resources into content of knowledge learning. With the employment of digital learning tools, a learning process with efficiency and easy access can be achieved featuring characteristic knowledge service. On the other hand, readers, after acquisition of knowledge, proceed with knowledge transformation on their own to create new knowledge. The new knowledge is in turn disseminated by various carriers of books, periodicals and internet, and solicited by libraries for cyclic usage.

In the library, knowledge production and consumption can be connected with circulation of knowledge by e-learning to form a knowledge service chain. Professional library services must transform information into knowledge, develop e-content, strengthen knowledge service connections and be redefined as follows:

Digital service value-added knowledge production accessibility:

Conventional publishing has a relatively high threshold because it requires complex and costly equipment. Digital publishing, which can be accomplished from any computer, has closed the gap between man and knowledge production. By means of the Internet, everyone can become a publisher and produce knowledge. For example, blogs are a kind of basic digital publishing. Anyone can regularly place content on the Internet in article format in chronological order. Texts and images can be combined with software. Blogs can also be linked to other blogs to make learning easy and simple. With what is referred to as customized digital publishing, everyone can participate in the knowledge production process. Library services need to provide this type of knowledge production environment and pathway. By means of e-learning and internet transmission, readers can access the digital resources held at the library to convert, create and reproduce knowledge.

Regulating the supply and demand balance of knowledge consumption:

In the past, the production and sale of knowledge was considered to be the main activity and occupation of libraries so knowledge collection, classification, retrieval and inquiry have always been the core work of libraries (Porat & Rubin, 1978). However, there was very little verification of whether service content corresponded to service demand. After everything is digitalized, readers can easily make use of internet sharing and learning to store and transmit knowledge in digital form. This will change knowledge consumption behavior and demand. Libraries need to take advantage of e-learning opportunities in order to become a knowledge center provider and carve out a place in the e-knowledge consumption market.

Creating an innovation model for knowledge flow:

From the viewpoint of e-learning, libraries provide an ideal channel for knowledge from upstream digital publishers to downstream knowledge learning communities. In the age of print-based publishing, the more complete source of information for readers was none other than libraries. With the rise of the Internet, users are able to define, provide and share internet platforms which have changed the nature of libraries. Since they are no longer centers of pure learning, the library

has become a place to facilitate community construction (Wiegand, 2003). New reading spaces that emphasize visual aesthetics and digital functions shall become places where libraries can bring together readers and knowledge and promote knowledge flow service techniques. In addition, libraries can provide cross-media (text/image, sound, paper, digital) and cross-discipline flow platforms that combine various types of publishing and various types of library service to create a brand new reading experience for readers that can inspire knowledge innovation and vitality.

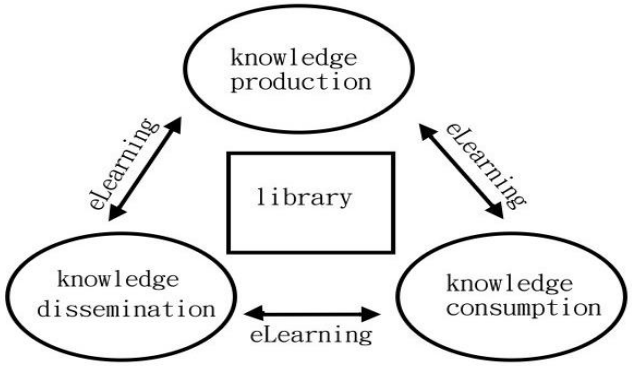

Figure.1 knowledge service chain of library

Paperless learning service model

In this digital information technology environment, libraries must learn how to actively transform themselves from a conventional library with physical paper-based collections to providers of paperless learning. Due to the wealth of animations, information and video viewing offered by digital content, e-learning systems and website interactive connections are effort-saving and serve as a major tool for digital services. The e-learning systems developed by libraries have adopted knowledge sharing as their central concept to spread knowledge to its fullest extent. The following two examples show the content of library digital service which are not only closely connected with e-learning, but also use on-line sharing and exchange of knowledge management to product infinite connections of knowledge.

Knowledge service platform —by National Central Library

With "E-Learning Daily, E-Harvest for life" as a slogan, National Central Library has recently launched a "Knowledge Service Platform" to promote its digitization achievements, allowing readers to experience brand-new reading pleasures from digitized knowledge of audio and video materials (National Central Library, 2011). Providing novel and varied digital learning content in a handy manner, this paper-free service combines and re-organizes library's knowledge management expertise and collections with digital learning content to establish a knowledge platform for easy sharing and effective searching and retrieval. The new knowledge platform will not only replace the paper-consuming Xerox copies and time-consuming repeated inquiries but encourage knowledge production and consumption for effective learning. The services include the followings:

1. Digital publication platform: Combining collections and reading service, this is an e-Publication Platform System (EPS) to digitize library's collections, exhibiting depth and breadth of knowledge collecting service that allows readers to read and learn on-line.
2. Multi-media audio and visual information service: Including Chinese Studies E- Classic Series Publication, Digital Audio Visual Archive System: DAVA, and Web Archive

Taiwan：WAT, they are featuring dynamic and diversified characteristics of digital videos to achieve information free flow.

3. Netting Bibliographic Service: Including Discovery on Bibliography in Taiwan and Metalibrary Bibliographic System, and Knowledge Support Portal, it allows users of free connection with database in various fields, providing convenient distance learning and exhibiting library's service synergy of knowledge management and information structuring.
4. Innovative and value-added knowledge service: Including National Digital Library of Thesis and Dissertations in Taiwan, PerioPath: Index to Taiwan Periodical Literature System, The Publication of Government Information, and The NCL Chinese Rare Book Information Net, those services that facilitate and expedite electronic-based research, infusing more energy into knowledge transformation and creation, one of the best practices of library's knowledge service chain.

A service hub for knowledge exchange and dissemination —by National Science and Technology Museum library

A Knowledge service by National Science and Technology Museum (NSTM) library is introduced in this case. To achieve best operation with professionalism, NTSM has been conducting various activities of collection, research, exhibition, education, and maintaining a specialized library to satisfy internal research needs. Along with digitalization trends in recent years, our library has adopted an Institutional Repository project, which not only collects various resources for internal digital learning but also opens to external use based on the concept of knowledge dissemination. Knowledge re-organized by the library is open to point-to-point sharing and exchange through digital learning, increasing knowledge production and accessibility. Four different types of digital resources are available in on-line learning:

Digitized literature collections

Valuable literature collections have been transformed into digitized formats to facilitate knowledge dissemination through internet. Including "Taiwan Technological Artifacts and Industrial Technologies," "Artifacts of Telecom Network Architecture in Taiwan," and "Industrial Heritage in Taiwan," digitized collection archives contain firsthand materials for studying and understanding Taiwan's cultural assets from an industrial perspective. All can be accessed through internet connection with NTSM providing valuable resources for digital learning.

Digitized exhibition materials

These are abundant resources of museum's theme exhibition in digital audio and visual formats which can be accessed through internet connection without limitation of time and space. Among these resources, documentary videos of interviews with highly respected industrial veterans in the "Industrial History of Taiwan" feature systematic introductions. Digital content made from exhibit content integrated with exhibition highlights become digital learning content offered by the library. Printed exhibition brochures, beautiful yet expensive, have also been gradually replaced by digital publication to reduce paper consumption. The concept of digital learning is not only environmental friendly but incorporates with multi-media applications offering on-line, paper-free learning materials in the library.

Digitized activities materials

The resources include teaching materials, teaching plans, highlights, video records of various activities, such as "Clothing and Textiles," "Open Sesame Science," and "LOHAS Energy Conservation House," and materials specially designed for digital learning, such as "A New World of Nanotechnology," "Biotech outlook" and "Moving & Shaking: Exploring Seismism."

All materials can be downloaded and become teaching resources for teachers in elementary and junior schools. Feedback can also be sent on-line.

Digitized research results

These resources include papers academic journals, research reports, speeches and presentations. Scattered research files in different disciplines have been gradually collected in digital knowledge management system as self-archiving resources. Digital resources of three periodicals and thirty books are available in library reading room's learning website. Open access, chargeable perhaps, in the future have been planned so that on-line learning will also become available through library's digital service.

Conclusion

Because of the impact of digital media, the role of libraries as information disseminator has changed. In the past, knowledge was largely passed down through written records. In the digital age, it is common practice to record knowledge in digital format and use the Internet as a mobile study resource (Wu, 2011). This creates a e-learning method that is available anywhere and anytime that has clear advantages over fixed site libraries that only offer services at certain times. The advent of e-learning, however, does not mean libraries will lose their role as centers of learning. Libraries will make use of their knowledge management skills to plan adaptive digital service that provide intelligent learning capabilities to people. More importantly, library will specialize in knowledge services and fully develop e-learning modes centered on knowledge. No longer limited by physical space, libraries can be transformed limitless virtual digital information storehouses. Through e-learning, the knowledge accumulation and dissemination process can be combined with green living environments to reduce the costs of paper printing and storage as well as expanding the power of knowledge beyond the age of paper-based knowledge.

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