E-Learning: A study on Secondary Students' Attitudes towards Online Web Assisted Learning

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Information and Communications Technology (ICT) at secondary schools has made positive inroads into learning. The use of online e-learning by members of educational communities is increasing. It is suggested that educators identify and address individuals' attitudes so that anxieties can be kept to a minimum while at the same time allowing learning to progress and be cultivated in a positive manner.

This research study examined the affective, behavioural and cognitive attitudes of 52 Year 10 students from an Adelaide Public Secondary School towards a specific type of online e-learning, that of Online Web-Assisted Learning (OWAL).

Data were collected to examine differences in attitudes between paper assisted learning and OWAL, of differences in attitudes towards OWAL between males and females, the correlation between Internet use and positive OWAL attitudes, and the 'publishing elements' that students find most appealing in OWAL.

Media in Education, Multimedia/Hypermedia Systems, Evaluation of CAL Systems, Human-Computer Interface, e-Learning

INTRODUCTION

With the advent of the microcomputer in the late 1970s, the quest for e-learning, or electronic-learning (that is, using a computer to aid in the learning process) at the school level had begun. Online learning (especially Online Web Learning or OWL) has emerged as one of the fastest moving trends in education today (Palmer et al., 2001). Dede (2000, p. 281) reinforces this concept with the statement:

> In developed countries, sophisticated computers and telecommunications are on the verge of reshaping the mission, objectives, content, and processes of schooling.

Since the start of the 1980s, Australian secondary schools have confronted with the issue of using computers in the classroom. Today ICT Education incorporates the use of the computer, its peripherals and Internet services within the student learning process and the teacher delivery process.

Computer usage in secondary schools has made many positive impacts and developments into learning. However the acceptance of ICT by schools, as with the current emergence of OWL, has been slow. However, in reference to Computer Based Learning (CBL), Woodrow (1991) points out that monitoring teacher and student attitudes is significant for communal usage, acceptance and success. Hence, this paper addresses the following research question:

What attitudes do secondary students have about Online Web Assisted Learning (OWAL), as compared to paper assisted learning (PAL), and what are the strengths of these attitudes?

KEY CONCEPTS

E-learning covers a broad area within ICT Education and comes in many media formats as seen in Figure 1.

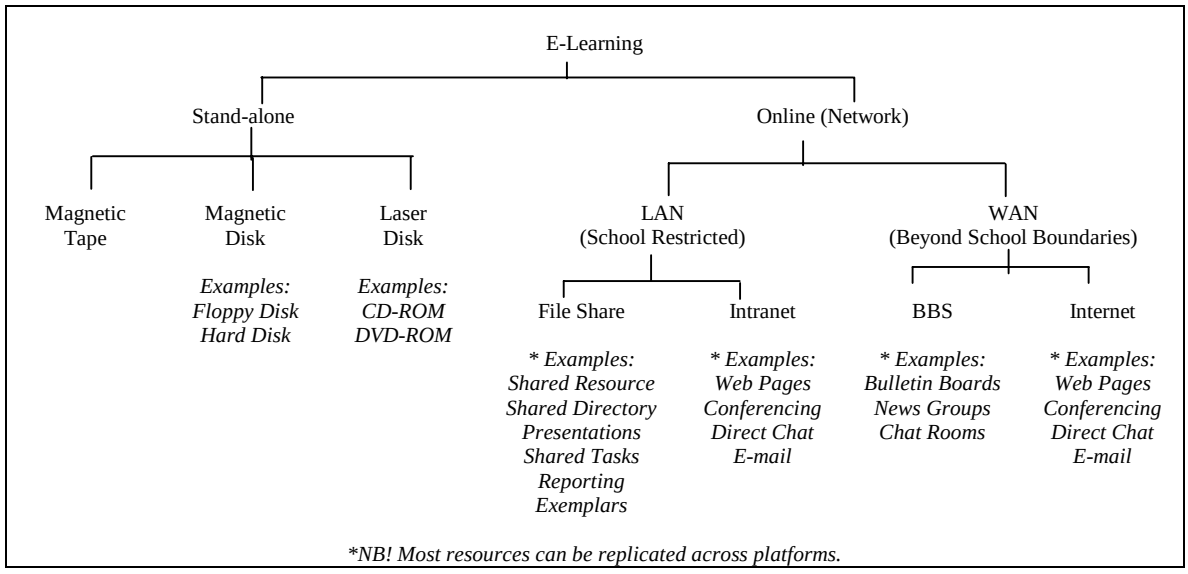

Figure 1. Media Formats of E-Learning

Today the most common format for e-learning is the Internet, which itself is a broad field of study as outlined by Palmer (2001, p. 314):

> The Internet offers a new range of educational technologies to educators that includes: electronic mail, file transfers, the multimedia capability of the World Wide Web, low cost desktop videoconferencing, online, interactive tutorials, real time group conferencing, remote access to laboratory experiments and 3D interactive modelling.

E-learning involves the use of computers to aid in the learning process. If a computer is standalone, then we have Computer Learning (CL) that can be used as either Computer Based Learning (CBL) or Computer Assisted Learning (CAL). CBL involves the computer taking the place, for the most part, of the teacher, and is popular in distance education. CAL involves a teacher using e-learning "to supplement face to face teaching" (Hong et al., 2001, p. 224). This also applies to computers networked to the Internet with web page access. As with CL, Online Web Learning (OWL) can either be Online Web Based Learning (OWBL) or Online Web Assisted Learning (OWAL). Figure 2 demonstrates the parallel relationship between CL and OWL.

THEORECTICAL FRAMEWORK

E-Learning

In a longitudinal study spanning 4 years at Deakin University Palmer and Bray (2001) found that "Student computer usage was rising… Student access to the Internet was rising … Student usage of the Internet was rising ... The proportion of students with access to the Internet at home was rising … Student usage of email was rising".

Woodrow (1994, p. 309) makes the statement, "it is of critical social and educational importance to research the circumstances under which student (and teacher) feel comfortable learning about and utilizing the computer as an essential tool for learning". Another study,

Hong et al. (2001) reveals that e-learning is becoming progressively an integral part of the secondary school's curriculum learning processes:

> Schools from elementary levels to universities are using the Web and Internet to supplement classroom instruction, to give learners the ability to connect to information (instructional and other resources) and to deliver learning experiences (Hong et al. 2001, p. 223).

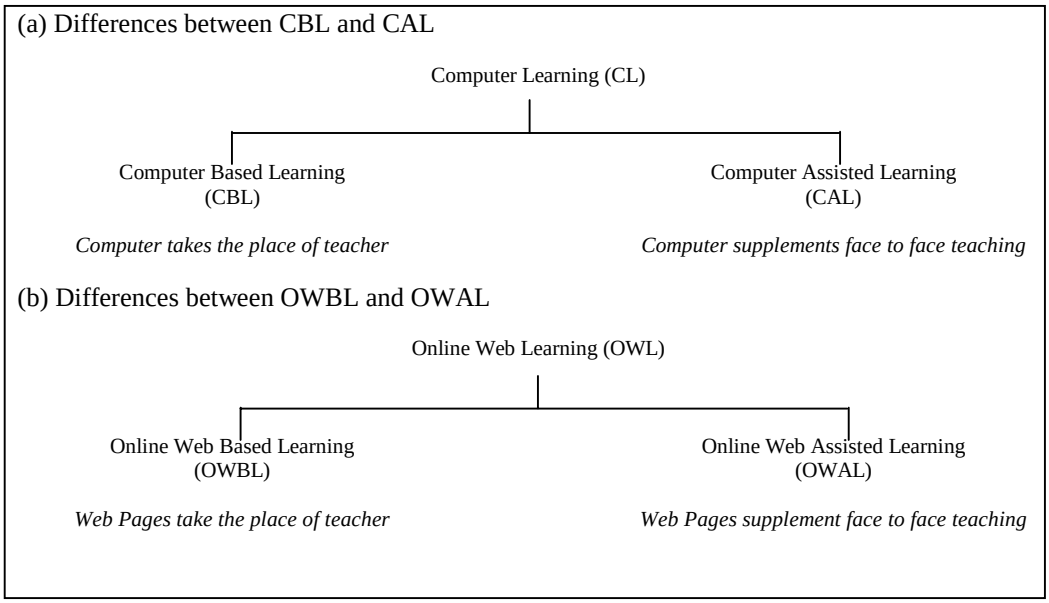

Figure 2. Comparisons between Computer Learning and Online Web Learning

Alessi and Trollip (1991) make a number of statements and recommendations about developing good e-learning material for students that appear pertinent for today's publishers of OWL. They consider the following good publishing elements:

- Text Presentation – "A critical factor affecting the quality of a (e-learning) tutorial is the length of information presentation",
- Graphics and Animation – "Pictures, especially animated ones, capture attention more than text",
- Colour – "Color is effective for attracting attention",
- Text Transitions – "It is difficult for a student to distinguish a change in display that represents a continuation, from one that represents changing to an entirely different topic, the equivalent of changing chapters in a book",
- Help Menus – "(Students) … frequently need help of two types, procedural and informational",
- Questions and Responses – "A lesson which presents information without demanding interaction with the student will not be successful", and
- The Response Economy – "The amount of typing or other physical activity required to produce a response should be as little as necessary" (Alessi & Trollip, pp. 34-63, 1991).

Alessi and Trollip's work was used in the development of the OWAL activities used in this study.

Attitudes

Breckler (1984) and Jones and Clarke (1994), proposed that affect, behaviour, and cognition are distinguishable, yet interrelated components of attitude. Breckler (1984, pp. 1191–1205) provides a continuum by which to measure these attitudinal components;

> Affect can vary from pleasurable (feeling good, happy) to unpleasurable (feeling bad, unhappy). Behavior can range from favorable and supportive (e.g., keeping, protecting) to unfavorable and hostile (e.g., discarding, destroying). Likewise, cognition or thoughts may vary from favorable to unfavorable (e.g., supporting versus derogating arguments), (Breckler, 1984, p. 1191).

Educators have known that learner attitudes and responses are interconnected and that a positive correlation exists between the two. Burns's study supports this with the statement that "attitudes are evaluated beliefs which predispose the individual to respond in a preferential way" (Burns, 1997, p. 456). Educators therefore have had the dynamic task of improving the curriculum, its delivery and resources in an attempt to fuel positive learner attitudes knowing that, in turn, it would improve learning outcomes.

Massoud (1991) points out that the interconnectedness of attitudes and responses also exists in ICT education. However, as a result of ICT emerging across all facets of education, anxieties are rising, especially among staff. Massuod (1991, p. 269) states that, "the existence of computer anxiety is often based on computer attitudes". Consequently, it is suggested that schools identify and address individuals' attitudes so that anxieties can be kept to a minimum while at the same time allowing learning to progress and be cultivated in a positive manner.

Additionally, prior ICT experiences influence attitudes towards ICT. Shashaani (1994, p. 348) states that, "recent empirical studies have shown that computer experience is positively related to computer attitudes". Woodrow (1991, p. 165) also points out that "awareness of student attitudes towards computers is a critical criterion in the evaluation of computer courses and in the development of computer-based curricula".

Gender

Shashaani (1997, p. 37) found that "females were less interested in computers and less confident than males", and, further, that "Females' lack of interest and low self-confidence regarding computers are related, to some extent, to their parents' behavior and expectations" (p. 40). By contrast, Katz et al. (1995, p. 241) in their research reported there was "no significant difference between the (attitude) scores of men and women". Data were collected to examine these issues in this study.

METHOD

Fifty-two Year 10 students from a low socio-economic district of Adelaide, South Australia were chosen for the study. The students were grouped into two cohorts of 26. Each cohort was allocated an 80-minute session involving three phases.

In Phase 1, a PAL activity was administered that utilised a senior secondary ICT text book (Chapter 7 of "Information Processing and Management: Units 3 and 4, School Edition", Scott et al., 1995) as its resource. In Phase 2, an OWAL activity was administered that involved multiple linked web pages as its resource. Both the PAL and OWAL activities included colourful photos and graphics. However the web pages also included animation, sound and hyperlinks. One cohort of Year 10 students did the PAL activity first; the second cohort of Year 10 students did the OWAL activity first.

Phase 3 of the study required the student participants to complete an online questionnaire. The items for the questionnaire were grouped into four sections: Section 1 gathered student personal details and ICT experiences; Section 2 gathered data on students' behavioural attitudes towards OWAL; Section 3 gathered data on the affective attitudes of students; and Section 4 examined the students' cognitive attitudes.

The items for the questionnaire used in Phase 3 were derived from two sources. One source came from responses provided by a group of 19 randomly selected Year 10 students prior to the study. The students were chosen during a study-line period and were asked to provide a written response to two open-ended questions as follows:

1. When learning for school work, which do you enjoy the most; a book or a Web Site?
2. If you have answered a WEB SITE, then please continue by answering the following question: What makes learning from a Web Site more enjoyable?

The other source came from the Jones and Clarke's (1994) Computer Attitude Scale for Secondary Students (CASS). The items for the CASS study were modified to include web page references instead of Computer references.

The questionnaire used in this study consisted of five-point Likert-type attitude scales.

DATA

The scoring for the questionnaire was established as follows: Strongly Agree: 5 points; Agree: 4 points; Undecided: 3 points; Disagree: 2 points, and; Strongly Disagree: 1 point.

Negative items had their scoring reversed. As in the CASS study, the gender specific item had its scoring reversed for the opposite gender only.

Table 1 illustrates the mapping of questionnaire items to the research questions.

Table 1. Mapping Questionnaire Items to Research Questions

Research Questions	Questionnaire Items
Differences in attitudes between PAL and OWAL	B4, B5 F1, F2, F3, F5, F6, F8, F13 O1, O2, O3, O4, O8, O10
Differences in attitudes towards OWAL between males and females	P1, P2, P3, P4, P5, P6, P7 F3, F5, F6, F7, F8, F9*, F10, F11*, F12*, F13, F14* O1, O5*, O6, 011*, O13*, O15
Correlation between Internet use and positive OWAL attitudes	P3, P4, P5, P6, P7, B1, B2, B3, B6, B7, B8*, B9*, B10*, B11*, B12*, B13, B14 F7, F8, F9*, F10, F11*, F12*, F14* O5*, O6, O7, O9, O12*, O13*, O14*
Publishing Elements that students find most appealing in OWAL	B5, B13, B14 F2, F3, F4, F13 O15

*Items from CASS

Table 2 presents each of the item codes used in the data collection and information processing stages.

Table 2. Definition of Questionnaire Item Codes

CODE	Questionnaire Items
P1	Indicate your gender
P2	Indicate your age group
P3	How many computers do you have at home?
P4	Do you have access to a computer at school to do your school work?
P5	Do you have access to a computer in the classroom for school work?
P6a	Do you have access to the Internet at home?
P6b	If YES to P6 - How often do you use the Internet for chatting (such as ICQ)?
P6c	If YES to P6 - How often do you use the Internet for school work?
P6d	If YES to P6 - How often do you use the Internet for playing games?
P7a	Do you have your own email account?
P7b	If YES to P7 - How often do you use the Internet for e-mailing?
B1	I have problems using the mouse when using Web Pages
B2	I have problems using the keyboard when using Web Pages
B3	I have problems using the scroll bars on the Web Pages
B4	If given a choice I would first search for a book to find information for a school project before I search for a Web Site
B5	If given a choice I would get most of my diagrams for school projects from a text book than a Web Site
B6	I avoid using Web Sites when ever I can
B7	I have problems finding my way around a Web Site
*B8	I learn to use new Web Sites by trial and error
*B9	Other students look to me for help with Web Sites
*B10	Using Web Sites has increased my interaction with other students
*B11	I develop shortcuts, and more efficient ways to use Web Sites
*B12	When I have a problem with a Web Site, I usually solve it on my own
B13	I can adjust Web Pages (such as Font sizes) to suit my needs
B14	I download objects (such as pictures and sound) from a Web Site for school use
F1	The Web Assisted activity terrified me
F2	The colours on the Web Assisted activity made it more interesting than the colours on the Paper Assisted activity
F3	I preferred the Web Assisted activity instead of the Paper Assisted activity because it had animation
F4	I preferred the Web Assisted activity instead of the Paper Assisted activity because it had sound
F5	I felt more uncomfortable using the Web Assisted activity than the Paper Assisted activity
F6	I found the Web Assisted activity more boring than the Paper Assisted activity
F7	School work that uses Web Sites for learning makes me feel happy
F8	If I had a choice I would prefer to learn from a book than from a Web Site
*F9	I feel helpless when asked to use Web Sites for school work
F10	I feel confident with using Web Sites
*F11	I feel threatened when others talk about Web Sites
*F12	Web Sites frustrate me
F13	I preferred the graphics on the Web Site better than the graphics on the Paper Assisted activity
*F14	I get a sinking feeling when I think of trying to use a Web Site
O1	The Web Assisted activity was easier to use than the Paper Assisted activity
O2	The Web Assisted activity was more difficult to read than the Paper Assisted activity
O3	The Web Assisted activity was more difficult to understand than the Paper Assisted activity
O4	Web Sites will take over Books in the future
*O5	Working with Web Sites will not be important to me in my career
O6	There should be more school work that uses Web Sites
O7	All subjects in the future will use Web Sites for learning
O8	Students learn more using Web Assisted activities than Paper Assisted activities
O9	Web sites are difficult to learn from
O10	Finding your way around a Web Site is harder than finding your way around a Book
*O11	Boys like using Web Sites more than girls do
*O12	People who use Web Sites for work are seen as being more important than those who don't
*O13	Working on Web Sites means working on your own, without contact with others
*O14	To use Web Sites you have to be highly qualified
O15	Learning from a Web Site is enjoyable because some include games and movies

*Items Derived from CASS
P – Personal, B – Behaviour (Behavioural), F – Feelings (Affective), O – Opinions (Cognitive)

ANALYSIS AND RESULTS

Thirty-four males and 18 females, a total of 52 Year 10 students (N=52), formed the subjects for this research study. Table 3 shows the age distribution of male and female students.

Table 3. Age and Gender distribution of Year 10 students

Age	Male	Female	Total
< 14 years old	0	0	0
14-15 years old	8	4	12
> 15 years old	26	14	40
Total	34	18	52

It can be seen from Table 4, that 97 per cent of the males and all of the females had access to at least one computer at home. Of the females, 22 per cent had two home computers, whereas 42 per cent of the males had two or more computers at home.

Table 4. Percentage of Number of Home Computers accessed by Students (N_m=34, N_f=18)

	Male	Female
One	56	78
Two	18	22
More than Two	24	0
Total	97	100

Table 5 highlights the fact that 97 per cent of the males (one male was banned from unsupervised computer usage) and all of the females had access to school computers. Seventy-four percent of the males and 44 per cent of the females used the classroom computer at some stage for schoolwork.

Table 5. Percentage of School Computer access by Students (N_m=34, N_f=18)

	Male	Female
School Access (Item P4)	97	100
Class Access (Item P5)	74	44

As illustrated in Table 6, 65 per cent males and 67 per cent females had 'Home Internet Access', while 76 per cent males and 89 per cent females had 'Home E-mail Accounts'. The 'Home E-mail Account' is in addition to their 'School E-mail Account'.

Table 6. Percentage of Home Internet Access and Personal E-mail Accounts (N_m=34, N_f=18)

	Male	Female
Home Internet Access	65	67
Email Account	76	89

Table 7 shows that 67 per cent of the females use the Internet for chatting and doing schoolwork, whereas 53 per cent and 50 per cent of the males used the Internet for chatting and doing schoolwork respectively. Table 7 also highlights that 89 per cent of the females use their e-mail account at least once per week in comparison to 74 per cent of the males.

Table 7. Percentage of Internet and Email Usage (N_m=34, N_f=18)

	1 pw		2 pw		3 pw		7 pw		Total	
	M	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**
Home Internet Chatting	12	22	6	11	18	22	18	11	**53**	**67**
Home Internet for school work	26	22	12	22	9	11	3	11	**50**	**67**
Home Internet for games	24	22	6	22	6	11	12	0	**47**	**56**
Email Usage	38	22	3	22	15	33	18	11	**74**	**89**

M – Male F – Female pw – per week

Reliability Analysis of Research Questionnaire

An Alpha reliability coefficient was computed on the items used in the research questionnaire. The purpose was to determine the extent to which items within each of the attitudinal groups related to each other. Table 8 shows the results of the internal consistency of these grouped items.

Table 8. Reliability Analysis of Items used in the Research Questionnaire

Attitudinal Components	No. Items	Cronbach Alpha
Behavioural Items	14	0.62
Affective (Feelings) Items	14	0.85
Cognitive (Opinions) Items	15	0.82

It can be seen from Table 8 that the items used to determine the Affective and Cognitive Attitudes of students have a good internal consistency of 0.85 and 0.83 respectively. That is, the items used to determine these attitudinal components were very reliable. However, upon examination of the items used to determine the Behavioural Attitudes of students, the Cronbach Alpha Coefficient was 0.62. This is below the recommended reliability value of 0.7. Pallant (2001, p. 85) suggests that the Cronbach Alpha value is quite sensitive to the number of options used in scales and states that "it is common to find quite low Cronbach values" especially with scales providing less than 10 options. The 5-point Likert Scale used in the research questionnaire may have contributed to the low Cronbach value. It should be noted that by removing Behavioural Items B10, "Using Web Sites has increased interaction with other students", and B13, "I can adjust Web Pages (such as Font sizes) to suit my needs", the Cronbach Alpha Coefficient reaches a value of 0.71.

Student Attitudes towards OWAL

Table 9 provides an overall summary of the results from the questionnaire. As an example, it can be seen from questionnaire item coded B14 that the males Mean rating was 3.7 while the females Mean rating was 4.3. The Mean ratings have a maximum score of 5 (based on the Likert rating scales) where 5 is a positive rating in favour of OWAL based activities as opposed to PAL based activities. Generally, both males and females rated OWAL favourably.

It should be noted that negative questionnaire items (shown with an asterisk in Table 9) were negatively scored. Furthermore, Questionnaire item '011' was gender positive in favour of males and as such female responses were negatively scored.

Table 10 provides a summary of the findings for males and females in relation to the CASS based items.

Table 9. Mean ratings of Attitudes to Questionnaire Items (N_m=34, N_f=18)

Behaviour			Affective			Cognition		
Item Code	Male	Female	Item Code	Male	Female	Item Code	Male	Female
B1*	4.4	4.3	F1*	3.8	3.8	O1	3.5	3.6
B2*	4.3	4.2	F2	3.4	3.4	O2*	3.5	3.3
B3*	4.3	4.2	F3	3.7	3.4	O3*	3.6	3.3
B4*	4.3	4.2	F4	3.6	2.8	O4	4.0	4.0
B5*	4.3	4.4	F5*	3.9	3.6	O5*	3.7	4.0
B6*	4.3	3.8	F6*	3.9	3.8	O6	4.2	4.2
B7*	4.1	3.9	F7	3.5	3.7	O7	3.8	3.9
B8	3.3	3.0	F8*	4.1	4.3	O8	3.8	4.0
B9	3.1	3.3	F9*	4.2	3.9	O9*	3.8	3.8
B10*	3.1	3.4	F10	4.3	4.2	O10*	3.5	3.3
B11	3.3	3.2	F11*	4.4	4.3	O11**	3.1	3.6
B12	3.8	4.0	F12*	3.9	3.9	O12*	3.1	3.1
B13	3.3	2.8	F13	3.9	4.4	O13*	3.5	3.7
B14	3.7	4.3	F14*	4.3	4.2	O14*	4.1	4.3
						O15	4.3	4.2

* Scoring Reversed; ** Scoring Reversed for Females only; Rating Maximum is 5 (based on Likert Scale) where 5 is positive in favour of OWAL

Table 10. Mean Ratings of CASS Based Questionnaire Items (N_m=34, N_f=18)

	B8	B9	B10	B11	B12	F9	F11	F12	F14	O5	O11	O12	O13	O14	Mean
Males	3.3	3.1	3.1	3.3	3.8	4.2	4.4	3.9	4.3	3.7	3.1	3.1	3.5	4.1	3.6
Females	3.0	3.3	3.4	3.2	4.0	3.9	4.3	3.9	4.2	4.0	3.6	3.1	3.7	4.3	3.7
Overall	3.2	3.2	3.3	3.3	3.9	4.1	4.4	3.9	4.3	3.9	3.3	3.1	3.6	4.2	

Rating Maximum is 5 (based on Likert Scale) where 5 is positive in favour of OWAL

As seen from Table 10, both male and female students generally demonstrated favourable attitudinal tendencies towards OWAL. While male students felt very confident in using Web Sites for learning (F9, F14) and generally felt that people do not need to be highly qualified to use Web Sites (O14), female students felt very confident towards solving Web based procedural problems (B12), and so did not felt threatened in discussing Web Site issues (F11), nor did they feel uncomfortable using Web Sites (F14). Females had a stronger tendency towards the importance of using Web sites for career advantages (O5).

Table 11 provides the mean ratings and the frequency distributions in percentages for questionnaire items that compare OWAL to PAL, where SA (Strongly Agreed) is in favour of OWAL.

As can be seen in the 'Overall Mean' of Table 11, 65 per cent of students ranked their scores 'Agree' to 'Strongly Agree' in comparison to 11 per cent who ranked their scores 'Disagree' to 'Strongly Disagree'. Hence 65 per cent of the students felt that OWAL activities were better than PAL activities, while 11 per cent of the students felt that PAL activities were better than OWAL activities; 24 per cent of the students were undecided. It should be noted that the scoring had been reversed for negative items. For instance, the questionnaire item 'F1 - The Web Assisted activity terrified me' had its scoring reversed so that the 'Strongly Disagree' response became the 'Strongly Agree' response, which is what is being reflected in the results of Table 11. Hence, the response frequency for questionnaire item 'F1' is in reference to the question 'The Web Assisted activity did NOT terrify me'.

Table 11. Differences in Attitudes towards PAL and OWAL (N=52)

Code	Questionnaire Item	Mean Rating	Frequency (%)				
			SD	D	U	A	SA
B4*	If given a choice I would first search for a book to find information for a school project before I search for a Web Site	4.3*	0*	8*	8*	37	48
B5*	If given a choice I would get most of my diagrams for school projects from a text book than a Web Site	4.4*	0*	6*	8*	31	56
F1*	The Web Assisted activity terrified me	3.8*	0*	4*	37*	35*	25
F2	The colours on the Web assisted activity made it more interesting than the colours on the Paper Assisted activity	3.4	2	17	35	29	17
F3	I preferred the Web Assisted activity instead of the Paper Assisted activity because it had animation	3.6	2	8	37	27	25
F5*	I felt more uncomfortable using the Web Assisted activity than the Paper Assisted activity	3.8*	2*	13*	23*	29*	33*
F6*	I found the Web Assisted activity more boring than the Paper Assisted activity	3.8*	0	4	33	38	25
F8*	If I had a choice I would prefer to learn from a book than from a Web Site	4.2*	2*	4*	17*	21*	54*
F13	I preferred the graphics on the Web Site better than the graphics on the Paper Assisted activity	4.1	2	2	27	21	48
01	The Web Assisted activity was easier to use than the Paper Assisted activity	3.5	6	12	29	33	21
02*	The Web Assisted activity was more difficult to read than the Paper Assisted activity	3.4*	6*	13*	19*	35*	23*
03*	The Web assisted activity was more difficult to understand than the Paper Assisted activity	3.5*	6*	8*	29*	35*	21*
04	Web Sites will take over Books in the future	4.0	2	8	12	38	38
08	Student learn more using Web Assisted activities than Paper Assisted activities	3.9	0	8	29	31	33
010*	Finding your way around a Web Site is harder than finding your way around a book	3.4*	2*	23*	17*	35*	21*
	OVERALL MEAN		2	9	24	32	33

SD- Strongly Disagree; D-Disagree; U-Undecided; A-Agree; SA-Strongly Agree;
*Scoring has been reversed and is reflected in these results
Rating Maximum is 5 (based on Likert Scale) where 5 is positive in favour of OWAL

Table 12 provides a summary of the relationship of gender to OWAL attitudes using Chi-square analysis.

Table 12. Chi-Square Analysis of Gender Dependence and OWAL Attitudes (N=52)

	Behaviour	Affective	Cognition	CASS
Chi-Square (Corrected values)	0.506	0.185	0.001	0.198
Asymptotic Significance	0.447	0.667	0.981	0.656

Table 12 indicates that there is no significant difference ($p<0.05$) in gender, and the behaviour, affective, cognitive and CASS based attitudes.

Table 13 examines the effect size of gender in relation to OWAL attitudes.

Table 13. Effect Size of Gender Dependence and OWAL Attitudes (N=52)

Attitude Components	Significance	t	Significance (2-tailed)	Eta Square
Behaviour	0.035	-0.846	0.402	0.014
Affective	0.396	0.531	0.598	0.006
Cognitive	0.450	-0.350	0.728	0.002
CASS	0.122	-0.500	0.619	0.005

An independent samples t-test was conducted to compare the attitudinal components and CASS based attitudes for males and females. Upon examination of the Effect Size, only 0.014 of the variance in Behavioural attitudes, 0.006 of the variance in Affective attitudes, 0.002 of variance in Cognitive attitudes, and 0.005 of variance in CASS based attitudes were explained by gender. That is, the magnitudes of the differences in the means for each of the attitudinal component, and the CASS based attitudes, were very small.

Hence both the Chi-square analysis and the Effect Size analysis indicate that the attitudes exhibited by males towards OWAL were not significantly different, nor significantly varied, to the attitudes exhibited by females. This supports Katz's study (see section above on Gender).

Table 14 outlines the relationship between Internet access and each of the attitudinal components using Pearson's product-moment correlation coefficient.

Table 14. Pearson Correlation between Internet access and Attitudes (N=52)

		Behaviour	Affective	Cognition	CASS
Home Access	Pearson Correlation (r)	0.199	0.111	0.228	0.088
	Sig. (2-tailed)	0.157	0.432	0.105	0.536
	Coefficient of Determination	3.9%	1.2%	5.2%	0.8%
School Internet Access	Pearson Correlation (r)	0.208	0.252	0.236	0.198
	Sig. (2-tailed)	0.140	0.072	0.093	0.160
	Coefficient of Determination	6.5%	6.4%	5.6%	2.6%
Classroom Internet Access	Pearson Correlation (r)	0.026	0.239	0.161	0.175
	Sig. (2-tailed)	0.858	0.087	0.255	0.214
	Coefficient of Determination	0.1%	5.7%	6.5%	3.1%

As seen in Table 14 there were small positive correlations between Home Internet Access and the components of attitude (e.g. Behaviour, r=0.199, N=52), School Internet Access and the components of attitude (e.g. Affective, r=0.252, N=52), and Classroom Internet Access and the components of attitude (e.g. Cognition, r=0.161, N=52).

When examining the coefficient of determination, it can be seen that at most, increasing access and use of Internet at home, school or classroom only contributed to 6.5 per cent (that is, the coefficient of determination for School Internet Access and the Behavioural Attitudes and Classroom Internet Access and Cognitive Attitudes) of the students overall positive attitudes towards OWAL. Therefore 6.5 per cent of the students exhibit positive attitudes towards OWAL activities regardless of opportunities and excess background access to the Internet.

Table 15 provides a summary of the mean ratings (where 5 is positive in favour of OWAL) obtained from the questionnaire.

Table 15. Publishing Elements Students find Appealing about OWAL in Comparison to PAL (N_m=34, N_f=18)

Publishing Elements	Mean Ratings		% Rated ≤2		% Rated ≥4	
	Male	Female	Male	Female	Male	Female
OWAL Diagrams (B5)	4.32	4.44	9	0	79	100
Adjusting OWAL pages (B13)	3.32	2.78	24	44	47	22
Download pictures and sound (B14)	3.74	4.33	21	0	71	100
OWAL Colours are more interesting (F2)	3.41	3.44	18	22	41	56
OWAL Animation preferred (F3)	3.68	3.44	9	11	56	44
OWAL Sound preferred (F4)	3.59	2.78	12	22	50	22
OWAL Graphics preferred (F13)	3.94	4.44	6	0	65	78
OWAL Games and Movies preferred (O15)	4.26	4.22	9	0	82	89

Rating Maximum is 5 (based on Likert Scale) where 5 is positive in favour of OWAL

It can be seen from Table 15 that the mean response from students was 4.32 for males and 4.44 for females in favour of the use of OWAL diagrams in comparison to PAL diagrams. Also 9 per cent of the males and no female provided a rating of 2 or less favouring PAL based diagrams. Similarly, it can be seen that 79 per cent of the males and all the females rated 4 or more on the Likert scale in favour of OWAL based diagrams.

Differences in attitudes between paper assisted learning and OWAL

Table 11 (Differences in Attitudes towards PAL and OWAL) shows a strong positive tendency by students towards OWAL. It appears that students prefer OWAL because they can get most of the diagrams required for school projects more readily from an Internet site than from a text book (B5, Table 11), they find the graphics on a Web site more appealing (F13, Table 11), and students believe they can find additional information more easily from the Internet (B4, Table 11). Seventy-six percent of the students believed that OWAL will replace books in schools in the future (O4, Table 11) and 52 per cent of the students enjoyed the fact that OWAL has animations (F3, Table 11).

Differences in attitudes towards OWAL between males and females

Though Table 12 (Chi-Square Analysis of Gender Dependence and OWAL Attitudes) and Table 13 (Effect Size of Gender Dependence and OWAL Attitudes) showed no significant difference in attitudes towards OWAL for males or females (all students perceived OWAL in a positive light). However, there were some differences that were evident from the data. For instance, it can be seen from Table 7 (Internet and Email Usage) that more females than males (nearly two-thirds of the females compared to about half the males) indicated that they used the Internet and e-mail for chatting and school work. This may be reflecting that females, more than males, pursue relationships and networking with people. Table 7 (Internet and Email Usage) also highlights that more females use Internet at home for games than males. This could be the result of males buying more commercial video games for as one male commented, “Internet games are boring”. The result could also be a reflection that females’ interests are not being addressed by commercial video game programmers and companies and as a result females are seeking game entertainment elsewhere.

The results in this study highlight that more females felt they could solve Web based procedural problems than males (B9, Table 9, Mean ratings of Attitudes to Questionnaire Items). A lot of Web based procedural problems come in the form text via ‘Help Menus’ and ‘Search Queries’. Predominantly, these forms of assistance involve reading that could

be disconcerting to some of the males. Other modes of assistance may need to be investigated to include the males preferred 'Trial and Error' techniques (B8, Table 9).

When asked directly it is evident that more males would use OWAL (B6, Table 9) than females if given a choice. This is further supported by Table 5, which indicates that more males than females are using the classroom computer. More males than females felt that they could find their way around the Internet (B7, Table 9). Males found the OWAL activity simpler to read than the PAL activity (O2, Table 9).

Overall, the attitudes expressed and demonstrated by both females and males were positive towards OWAL.

Correlation between Internet use and positive OWAL attitudes

This research study highlights that home computers are being used extensively by students from a low socio-economic area. Nearly all students had at least one computer at home, while many had two or more (Table 4, Number of Home Computers accessed by Students). Additionally, at least two-thirds (Table 6, Home Internet Access and Personal E-mail Accounts) of the students had Internet and e-mail access from home. An anomaly appears in Table 5 (School Computer access by Students) where more students indicated personal e-mail accounts in comparison to home Internet access. This could be the result of students using the school's computer network to create private Web based e-mail accounts even though they all have a school based e-mail account.

As demonstrated in Table 12 (Chi-Square Analysis of Gender Dependence and OWAL Attitudes) there are tendencies towards positive OWAL attitudes and the use of the Internet. As Internet and computer use are increasing (Palmer et al, 2001, p. 313), it would seem obvious that educators follow suit and take advantage of the positive attitudes of their students.

Having Internet access at school generated stronger positive attitudes among students (Table 12) than having access to the Internet at home or in the classroom. This could be the result of the school Internet being online 24 hours a day, everyday, and that all computers within the school have access to the Internet. It is the general school policy to allow unlimited Internet access for students and staff due to the lack of resources within the school.

Home Internet access generated slightly lower levels of positive attitudinal responses from students. This could be attributed to students using the home Internet for entertainment and socialising, while at school the Internet is used for learning, henceforth students may be finding OWAL intrusive.

Classroom Internet access generated the lowest levels of positive attitudes towards OWAL. It could be reflecting that not all subject teachers are using the classroom computer effectively. It may mean that students are not given appropriate access time nor being modelled positive learning practices by classroom teachers in using the classroom computer, or the teacher may not be utilizing OWAL type activities in the classroom to enhance curriculum delivery. This reinforces the notion that teachers may be a contributing factor in the slow acceptance of OWAL and ICT in general within schools because they are either resisting the change; lacking skills and/or knowledge of the utilization of OWAL type activities; or (although not the case in this study) are lacking ICT resources.

Publishing elements that students find most appealing in OWAL

Most students showed strong preferences towards OWAL publishing elements as opposed to PAL publishing elements (Table 15, Publishing Elements Students find Appealing about

OWAL in Comparison to PAL). Most students favoured OWAL offerings of diagrams, games, animations and movies. It becomes apparent that the use of multimedia facilities in the learning process such as that provided by Web sites are attracting and keeping students motivated.

However, there were slight variations in preferences between males and females in terms of OWAL publishing element preferences. For instance, females showed stronger positive preferences for features such as downloading sounds and graphics as provided by the OWAL activity whereas males showed stronger preferences towards the provision of customising Web pages, animation, synchronous sound, games and movies. In contrast, being able to adjust Web pages and using synchronous sounds from Web pages attracted a slightly negative rating from females (mean rating at 2.78, Table 15). This could be an indication that males require immediate stimuli to help keep them motivated whereas females are more motivated by the option of downloading resources that will help them complete future tasks, such as importing pictures into assignments or text for quotes. Females also exhibited a slightly stronger tendency towards the use of colours on Web pages.

CONCLUSION

The research study has generated a number of outcomes to the research question,

What attitudes do secondary students have about Online Web Assisted Learning (OWAL), as compared to paper assisted learning (PAL), and what are the strengths of these attitudes?

Based on the findings of a group of Year 10 students from a low socio-economic high school, the following are some outcomes:

- Rank OWAL activities positively in preference to PAL activities.
- Prefer the multimedia aspects of OWAL such as animation, movies, graphics and synchronous sound. Generally it would appear that where one media format may not enhance the learning process of one student, it may enhance the learning process of another.
- Do not find all publishing elements appealing. For instance, the option of adjusting Web pages and synchronous sound appealed to the males but not females.
- Have parental expectations and encouragement in the use of computers and the Internet at home to help supplement their child's education with or without the support of the school.
- Support the finding by Katz et al. (1995) study that concludes that there are no significant differences between the attitudinal scores of males or females.

This research study also indicates that some students engage in and accept the use of OWAL to supplement their learning, if not at school, then at home. The data indicate that OWAL activities would aid in the learning process of students because students have positive attitudes towards the use of OWAL.

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