Indian Journal of Science and Technology, Vol 9(32), DOI: 10.17485/ijst/2016/v9i32/100740, August 2016
ISSN (Print) : 0974-6846
ISSN (Online) : 0974-5645

Gender based Analysis of using Virtual Learning Environment

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Abstract

Objectives: To perform a gender analysis on the usage of Virtual Learning Environment (VLE) of simulation based e-learning in the field of Software Engineering in specific reference to the dynamic complexity, a modeling framework for Software Engineering Simulation based e-Learning Environment (SESeLE) tool is needed and has been proposed. **Method/ Statistical Analysis:** A questionnaire based survey has been carried out twice on the learners enrolled in Computers and Information Technology based courses at tertiary levels in and around the city of Chandigarh in north India. The learners were provided an interactive single-learner environment of the SESeLE which was accessible through the internet by using a standard web-browser. In all, 392 students of tertiary level were included as subjects and were made to respond twice on the issues like their practical knowledge of software handling, interest and knowledge in software project management and impact of e-learning on their knowledge in software project management through questionnaire survey. The questionnaire was first got filled up from the subjects without any exposure to the SESeLE and subsequently after a training session on the SESeLE. ANOVA test was performed to find out the significant differences in various learning styles on post-training test scores overall and in both male and female students as well. **Findings:** This study is unique and one of its own kind. It has been used to analyse the impact of using VLE tools by the learners/students on their learning and also for the gender analysis on various parameters. The web based learning style has been found to be the most preferred learning style among female students and the second most preferred style of learning among male students. Reading textbooks was not significantly popular among female students as compared to male students. About half of the students agreed to participate in any kind of seminar on software project management. The post-training test score on the knowledge about typical patterns observed in software project management issues has been found to be significantly higher from pre-training test scores. No significant difference has been found among the average response of the male and female students on all issues related to their Interest in Software Project Management. The post-training test scores of male and female students on both the issues of simple and difficult software project management were significantly different; the pre- and post-training test scores of the students on both the issues were different significantly; and lastly, significant difference was found between the post-training test scores on both the issues among students categorized according to their preferred choice of learning. **Application/Improvements:** It will be interesting to evaluate, in future, the effectiveness of SESeLE for the learners.

Keywords: ANOVA, Gender Analysis, Impact of Learning Styles, SESeLE, Virtual Learning Environment

1. Introduction

Today, we are part of the fourth generation of distance learning society which is trying hard to thrive on the concept of online learning. The term "online learning" can alternatively be called by any of the following names such as: tele-learning, e-learning, distributed learning, computer-assisted learning, Internet learning, web-based learning, virtual learning or distance learning[1–3]. The learners across the globe, belonging to different

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ethnicities, cultures and classes have either already joined the band wagon of e-learning or are preparing themselves to embark upon this journey soon. There can be difference of opinions on the extent to which e-learning should support to the formal class room teacher-centric learning. But there can be no disagreement on its effective usage to enhance the satisfaction level of learners. Although the concept of e-learning is being used as a matter of state-of-the-practice across all the disciplines of formal education systems all over the world, its usage with the help of relevant tools by the students studying Computer Science or Information Technology or Computer Applications at the secondary or tertiary levels is quite desirable. The specific tools of special interest here are the Virtual Learning Environment (VLE) tools. Also, the authors felt a need to carry out a gender analysis on the usage of these tools by these sets of students at the tertiary level of education i.e., in higher education. Therefore, the authors envisaged to carry out a survey in the colleges/universities in some part of North India as a pilot project before taking this up at a larger scale across the whole of North India covering 7 states of India. In order to undertake this study on gender analysis on the usage of e-learning platform in Software Engineering Simulation based e-Learning Environment (SESeLE) and suggest its findings, a questionnaire based survey was conducted twice on the same set of students. For this, we approached some affiliated colleges of Panjab University, Chandigarh, India where we earmarked approximately 400 learners as subjects from courses such as Master of Computer Application i.e., M.C.A., Master of Science in Information Technology i.e., M.Sc. (I.T.) and Bachelor of Computer Application i.e., B.C.A. and some from the Bachelor of Technology in Computer Science Engineering i.e., B. Tech. (C.S.E.). In this research, we first made the learners aware of operations of the e-learning platform in SESeLE. In order to make the experiment interesting to the subjects, we provided an interactive single-learner environment of the SESeLE which was accessible through the internet by using a standard web-browser. The objective of providing this kind of environment was to raise interest of learners in the topic of software project management and to make them aware of some of the difficulties associated with controlling the dynamic complexity of the software projects. The training module of SESeLE tool used in the study is composed of course material on project planning and control. The arrangement and presentation of the course material is defined by the single-learner training scenario.

2. Demographic Analysis of the Students of Technical Courses

The students surveyed in this section have been analyzed on the bases their gender (Male and Female), age (in years) and year of the degree course in which currently enrolled. Table 1 shows the gender distribution of students of technical courses as well as their percentage involved in the study. The analysis of the Table 1 shows that there are 392 respondents, out of which, 222 (56.6%) are male and 170 (43.4%) are female respondents. Table 2 discusses the age (in years) distribution of students of technical courses in terms of descriptive statistics of the study. Also, significance age distribution has been measured among the surveyed male and female students. The analysis of the Table 2 of 392 Students of Technical Courses shows an average age of 21.47 ± 1.7 years: the minimum age of the students, being 19 years and maximum being 24 years for both male and female students. Also it has been found that there is a significant difference $p < 0.05$ among the age of the male students (21.63 ± 1.8) as their average age was higher in comparison to the average age of the female students (21.26 ± 1.7) involved in the study. Otherwise in both the gender groups the range of the age in years was 19-24 years. Table 3 illustrates the frequency distribution of students in accordance to the year of their degree in which currently enrolled in an Institutions/University. This categorization has been applied gender wise among students. The analysis of the Table 3 shows among the total of 392 students surveyed, majority of the students i.e., 81.6% are in their third year of study whereas 11.5% of the students are studying in their second year and the minimum number of students surveyed are from first year of study i.e., 6.9%. Among all 320 students surveyed from third year of study, majority of them are male students i.e., 56.2% and 43.4% are the female students but the students selected from the second year of study show a majority of them are female students i.e., 73.3% and 26.7% are the male students. All the students selected from the first year of study are male students.

Table 1. Gender distribution of students of technical courses

	Frequency	Percentage	Cumulative Percent
Male	222	56.6	56.6
Female	170	43.4	100.0
Total	392	100.0	

Table 2. Age-distribution (in years) of students of technical courses

Gender	Mean	SD	Minimum age	Maximum age
Male	21.63	1.807	19	24
Female	21.26	1.753	19	24
Overall	21.47	1.791	19	24

Table 3. Distribution of students of technical courses in terms of their year of study in institution/university

		Year of Study			Total
		Year 1	Year 2	Year 3	
Male	**Number of Students**	27	12	183	222
	%age of students (year-wise)	100.0%	26.7%	56.2%	56.6%
Female	Number of Students	--	33	137	170
	%age of students (year-wise)	--	73.3%	42.8%	43.4%
Total Students		27	45	320	392
%age of total students (year-wise)		6.9%	11.5%	81.6%	100%

3. Practical Experience of Software Engineering Students

In this section of analysis the surveyed students have been analyzed for their practical experience in software engineering as they are surveyed on the issues like experience in writing software codes, computer simulation[4,5], participation in practical work, experience of working in large teams and kind of industrial exposure, if any. Table 4 displays the distribution of students having no experience or some experience in writing any kind of software. The analysis of the Table 4 shows that among 392 respondents surveyed, 356 (90.8%) students have written some kind of a software program and among them the proportion of the male students is (52.2%) and female student (46.8%) differ significantly ($p = 0.002$). Table 5 displays the distribution of students in reference to their participation in any kind of software engineering practical work. The analysis of the Table 5 shows that the practical experience in software engineering is 94.1% among all the students surveyed i.e., 369 students out of 392 students. Amongst them, 53.9% (199) male students are with practical experiences as compared to 46.1% (170) female students and their proportion is statistically significant ($p = 0.003$). Table 6 shows

Table 4. Frequency distribution of students of technical courses in terms of their experience in writing software

		Software Written		Total
		Yes	No	
Male	Number of Students	186	36	222
	%age of students (experience-wise)	52.2%	100.0%	56.6%
Female	Number of Students	170	--	170
	%age of students (experience-wise)	47.8%	--	43.4%
Total number of Students		356	36	392
%age of total students (experience-wise)		90.8%	9.2%	100%

Table 5. Frequency distribution of students of technical courses in terms of their participation in software engineering practical work

		SE Participation		Total
		Yes	No	
Male	Number of students	199	23	222
	%age of students (participation-wise)	53.9%	100%	56.6%
Female	Number of students	170	---	170
	%age of students (participation-wise)	46.1%	---	43.4%
Total number of students		369	23	392

Table 6. Frequency distribution of students of technical courses in terms of their participation in large teams

		Large Teams		Total
		Yes	No	
Male	Number of students	40	182	222
	%age of students (Team-wise)	55.6%	56.9%	56.6%
Female	Number of students	32	138	170
	%age of students (Team-wise)	44.4%	43.1%	43.4%
Total Number of students		72	320	392
%age of total students (Team-wise)		18.4%	81.6%	100%

the distribution of students in reference to their participation in a large teams to develop software. The analysis of the Table 6 shows that out of the 392 students surveyed, only 18.4% had experience of working with large teams (Team > 4 members) was quite unexpected as 81.6% students report that they have no as such experience. Also it has further been identified that among 72 students who have the experience of working in large teams, 55.6% were male students i.e., 40 (out of 72) as compared to 44.4% female students i.e., 32 (out of 72). Table 7 depicts the distribution of students according to their experience in any software development project in an industry. It shows that 60.6% (238 out of 392) students report that they have participated in some software development projects in the industry. Amongst these students, distribution of both male (50.4%) i.e., 120 out of 238 and female (49.6%) i.e., 118 out of 238 students all having industrial experience is almost equal. 39.4% (154 out of 392) students surveyed do not have any kind of industrial experience. Out of these students, 66.2% are male and 33.8% are the female students.

4. Software Project Management Literature

In this section, we discussed the results of the students who were surveyed on issues like number of books being referred for software project management, their preferred style of learning etc. Table 8 depicts the frequency distribution of the students according to the number of books they refer to in developing any software project.

Table 7. Frequency distribution of students in terms of their participation in any software development project in industry

		Exp. in Industry Env.		Total
		Yes	No	
Male	Number of students	120	102	222
	%age of students (Industry exp-wise)	50.4%	66.2%	56.6%
Female	Number of students	118	52	170
	%age of students (Industry exp-wise)	49.6%	33.8%	43.4%
Total Number of students		238	154	392
%age of students (Industry exp-wise)		60.6%	39.4%	100%

The majority of students, 54.8% i.e., 215 out of 392 prefer to refer 3-5 books while developing any software and amongst them majority are females (76.5% i.e., 130 out of 170) and 38.3% (i.e., 85 out of 222) are males students. Also, 24% students i.e., 94 out of 392 prefer 1-2 books for reading contents and among them male and female students are in almost same proportion i.e., 24.3% and 23.5% respectively. There are also some surprising results obtained as all 36 students who report that they do not consult any type of books for software development, they all are male students and all those 47 students who read more than five books for reference are all female students only. Table 9 displays the distribution of students according to their preferred learning styles. As per the data shown in Table 9, based upon four different learning styles, it is found that the style preferred by most of the students, male as well as female, is Web based learning style (76.3% i.e., 303 out of 392). 88.2% (i.e., 150 out of 170) female students prefer this learning style as compared to 68.9% (i.e., 153 out of 222) male students and it is also the most preferred learning style among male students. The second most preferred learning style among males is Book Reading i.e., 19.4% (43 out of 222) as this style was not so common among the female students i.e., 1.2% (2 out of 170). The least common learning style among male as well as female students is group work at

Table 8. Frequency distribution of the students according to the number of books they refer to in developing any software

Books Read	0	1 – 2	3 – 5	> 5	Total
Male	36 (16.2%)	54 (24.3%)	85 (38.3%)	47 (21.2%)	222
Female	0 (0%)	40 (23.5%)	130 (76.5%)	0 (0%)	170
Total	36 (9.2%)	94 (24.0%)	215 (54.8%)	47 (12.0%)	392

Table 9. Frequency distribution of the students according to their preferred learning styles

Learning Style	Reading Textbooks	Class Lecturers	Group Work	Web Based Learning	Total
Male	43 (19.4%)	16 (7.2%)	10 (4.5%)	153 (68.9%)	222
Female	2 (1.2%)	9 (5.3%)	9 (5.3%)	150 (88.2%)	170
Total	45 (11.5%)	25 (6.4%)	19 (4.8%)	303 (77.3%)	392

4.8% (19 out of 392). The Class–lectures style of learning is not so common among both sexes as overall 6.4% (25 out of 392) of them prefer this learning style and 7.2% (i.e., 16 out of 222) male students and 5.3% (i.e., 9 out of 170) female students showed interest in this learning style. Reading textbooks is at 11.5% (i.e., 45 out of 392) for both male and female students but is not significantly popular among female students (1.2% i.e., 2 out of 170) as compared to male students (19.4% i.e., 43 out of 222).

5. Assessment of e-Learning of Students of Technical Courses (Pre-Training Test)

This section analyzes the results obtained after conducting a pre-training test as mentioned in[6] on all the selected students. The pre-training test was conducted on two core issues i.e., Interest in Software Project Management which was measured on Linkert scale and knowledge about typical behaviour patterns observed in Software Development Projects. The pre-training test questionnaire included multiple choice questions not only on the issues of knowledge about simple Software Project Management but also on the issues of knowledge about difficult Software Project Management.

6. Interest in Software Project Management

The analysis of the Table 10 shows that the majority of students i.e., 58.7% agree and 19.4% fully agree on the importance of knowing about Software Project Management while only 13.5% students are neutral on this issue and rest 8.4% are (5.6% D + 2.8% FD) were in disagreed frame. On the two other major issues i.e., the students would students like to get more information on software project management and whether they consider it important for software engineers to know as much as possible about software project management, 66.8% and 90.8% students have been found to be neutral. 33.2% students agree on first issue. As can be seen from the Table 10, 90.8% students fully agree that stated that they would like to learn more about software project management while rest 9.2% are neutral on this issue. Also, there were about 66.8% students who agree and 24.0% students who fully agree to participate in any kind of seminar on software project management while only 9.2% students are neutral on this issue. To find out the gender sensitivity we further categorize male and female students to evaluate their level of response on all the above issues. The following Table 11 presents the average (median) response of the male and female students along with p-values generated from Mann-Whitney test. Null Hypothesis $H_{0,1.1}$: There is no significant difference between the average response of the male and female students on all issues related to their Interest in Software Project Management. The significant differences when statistically evaluates on p-values of Mann-Whitney test state that male and female students agreed with no significant differences ($p = 0.284, 0.807, 0.259$) on issues like Important to know about SPM, Like to participate in Seminar on SPM and Important for software engineers to know about *SPM* but both sexes with no significant differences are neutral on Like to get more information on *SPM* ($p = 0.634$) and *Like to learn more about SPM* ($p = 0.969$). Hence the Null Hypothesis $H_{0,1.1}$ is proved to be true.

Table 10. Response analysis of the students on interest in software project management

	FA	A	U	D	FD
Important to know about SPM	76 (19.4%)	230 (58.7%)	53 (13.5%)	22 (5.6%)	11 (2.8%)
Like to get more information on SPM	--	130 (33.2%)	262 (66.8%)	--	--
Like to participate in Seminar on SPM	94 (24.0%)	262 (66.8%)	36 (9.2%)	--	--
Important for software engineers to know about SPM	--	--	356 (90.8%)	36 (9.2%)	--
Like to learn more about SPM	356 (90.8%)	--	36 (9.2%)	--	--
FA – Fully Agree A – Agree U – Undecided D – Disagree FD – Fully Disagree					

Table 11. Response analysis among both male and female students on all issues related to their interest in software project management

	Male	Female	p-value
Important to know about SPM	2.00	2.00	0.284
Like to get more information on SPM	3.00	3.00	0.634
Like to participate in Seminar on SPM	2.00	2.00	0.807
Important for software engineers to know about SPM	2.00	2.00	0.259
Like to learn more about SPM	3.00	3.00	0.969

7. Knowledge about Typical Patterns Observed in Software Projects

The Table 12 shows that 69.6% i.e., 273 out of 392 students (males 78.9%, females 56.6%) believe that finding and fixing any software problem after delivery is five times more expensive than doing it in requirement or early design phase. It is interesting to not here that 78.9% of the total males and 56.6% of the total females believe in this proposition. It is only 30.4% students who believe that finding and fixing any software problem after delivery is three times more expensive than doing it in requirement or early design phase. Here, 21.2% of the males and 42.4% females chose to go agree with this proposition. None of the students believe that finding and fixing any software problem after delivery is 10 times or 100 times more expensive. The Table 13 shows that 58.2 % i.e., 228 out of 392 students (74.8% of total males and 36.5% of total females) assume that by adding manpower, the nominal schedule of a typical Software Development Project (SDP) can be compressed up to 25%. On the other side 41.8% i.e., 164 out of 392 students (25.2% of the total males and 63.5% of the total females) assume that by adding manpower, the nominal schedule of a typical Software Development Project (SDP) can be compressed up to 10%. None of the students believe that the schedule can be compressed by 40% or 60% by adding manpower. The Table 14 shows that the majority of students i.e., 76% (298 out of 392), both sexes, (75.7% of the total males and 76.5% of the females) believe that software development cost is primarily a function of tool usage. In contrast, 24.3% students (94 out of 392) which include 24.3% of total males and 23.5% of total females believe it to be a function of product quality. None of the students believe that it is a function of product size or work force allocation. The Table 15 shows that the issue of comparison between the software programs, majority of students i.e., 44.6% (175 out of 392) students (24.0% of the total males and 20.7% of the total females) believe it to be a people skills. 24% students (5.9% of the total male and 46.6% of total female) also believes the variation results due to programming language and 20.7% believes (24.3% of the total males and 15.9% of the total females) it to be programming style. None of the students believe that tool support has any impact on the variations. The Table 16 shows that 54.9% (215 out of 392) students (71.1% of total males and 33.5% of total females) think that 60% of the defects were detected on inspection in typical software development projects whereas 24.0% i.e., 94 out of 392 (5.9% of the total males and 46.6% of total females) believe it to be detection of 25% of defects and 22.7% i.e., 89 out of 392 (23.0% of the total males and 18.8% of the total females) think it detects 40% of defects. None of the students thinks that 90% of the defects can be detected during software inspection.

Table 12. Gender based data on finding and fixing software problems

Finding and Fixing a software problem after delivery is about _ times more expensive than doing it in requirement or early design phase	3 times	5 times	10 times	100 times
Male	47 (21.2%)	175 (78.9%)	--	--
Female	72 (42.4%)	98 (56.6%)	--	--
Total	119 (30.4%)	273 (69.6%)	--	--

Table 13. Gender based data on nominal schedule compression

Nominal Schedule of typical SDP can be compressed up to_ % by adding manpower	10%	25%	40%	60%
Male	56(25.2%)	166(74.8%)	--	--
Female	108(63.5%)	62(36.5%)	--	--
Total	164 (41.8%)	228 (58.2%)	--	--

Table 14. Data on software development cost function

Software Development cost is primarily a function of	Tool Usage	Product Quality	Product Size	Workforce Allocation
Male	168 (75.7%)	54 (24.3%)	--	--
Female	130 (76.5%)	40 (23.5%)	--	--
Total	298 (76.0%)	94 (24.3%)	--	--

Table 15. Data on comparing SDP variations

On comparing SDP, variations results due to	Male	Female	Total
Programming Language	13 (5.9%)	81 (46.6%)	94 (24.0%)
Programming Style	54 (24.3%)	27 (15.9%)	81 (20.7%)
People Skills	67 (30.2%)	108 (63.5%)	175 (44.6%)
Tool Support	--	--	--

Table 16. Data on detection of defects during software inspection

Software Inspection detects about % of defects	25%	40%	60%	90%
Male	13 (5.9%)	57 (23.0%)	158 (71.1%)	--
Female	81 (46.6%)	32 (18.8%)	57 (33.5%)	--
Total	94 (24.0%)	89 (22.7%)	215 (54.9%)	--

8. Pre-Training Test Scores

In this section we analyze the knowledge of students on the issues of Knowledge about simple SW projects dynamics (P1) and Knowledge about difficult project management issues (P2) for which the information was gathered during pre-training test. The Table 17 presents the overall scores of the students in pre-training test over on both the issues and categorized scores male and female students separately. Also it evaluates the p-values generated from the T-Test to assess the significant difference between the scores of the both male and female students on both these issues. Null Hypothesis $H_{0,1.2}$: There is no significant difference between the pre-training test scores of the male and female students on both the problems. The analysis of the Table 17 on the issue of *Knowledge about simple SW projects dynamics (P1)* shows that the overall score of the students is 21.04 ± 2.6 and there is no significant difference among the scores of male (21.10 ± 2.58) and female (20.96 ± 2.66) students respectively. On the other issue of *Knowledge about difficult project management issues (P2,)* the overall score of the students is 20.84 ± 3.8 and it shows that there is significant difference in scores among male students (21.19 ± 3.88) and that of female students (20.39 ± 3.8). Therefore, our Null Hypothesis $H_{0,1.2}$ gets negated.

9. Post-Training Test Analysis

In this section we analyze the scores of post-training test is conducted to assess the knowledge of students on issues of Knowledge about simple SW projects dynamics (P1) and Knowledge about difficult project management issues (P2). The Table 18 presents the overall scores of the students in post-training test in the above mentioned problems and categorized scores of both male and female students. It also evaluates the p-values generated from the T-Test to assess the significant difference between the scores of both male and female students. Null Hypothesis $H_{0,1.3:}$ There is no significant difference

Table 17. Pre-training test analysis of male and female students on issues of p1 and p2

	Gender	N	Mean	SD	P-value
P1	Male	222	21.10	2.580	0.603
	Female	170	20.96	2.660	
	Total		21.04	2.6	
P2	Male	222	21.19	3.877	0.042
	Female	170	20.39	3.802	
	Total		20.84	3.8	

Table 18. Post-training test analysis of male and female students

	Gender	N	Mean	SD	P – value
P1	Male	222	28.86	4.679	0.000
	Female	170	30.88	3.069	
	Total		29.73	4.1	
P2	Male	222	27.7	5.361	0.828
	Female	170	27.79	2.398	
	Total		26.74	4.3	

between the post-training test scores of male and female students on both the issues. The analysis of the Table 18 on the issue of the problem Knowledge about simple SW projects dynamics (P1) show that the overall score of the students is 29.73 ± 4.1 and there are significant differences among the scores of male (28.86 ± 4.7) and female (30.88 ± 3.0) students respectively. On the other issue of *Knowledge* about difficult project management issues (P2), the overall score of the students is 26.74 ± 4.3 and there is significant difference among the scores of male (27.70 ± 5.3) students and female (27.79 ± 2.3) students. Hence the Null Hypothesis $H_{0,1.3}$ gets negated.

10. Pre-Post Training Test Analysis

In pre–post training test evaluation of students on Knowledge about simple Software projects dynamics (P1) and Knowledge about difficult project management issues (P2), the scores have been compared to assess the effectiveness of the e-learning among students. The Table 19 compares the pre and post-training test scores on both the issues overall and among male and female students also. Null Hypothesis $H_{0,1.4}$: There is no significant difference between the pre and post-training test scores of the students on both the issues. The average scores on P1 among male students in post-training test is 28.86 ± 4.67 which significantly increase from 21.10 ± 2.58 in pre-training test analysis. Similarly, among female students post-training test score is 30.88 ± 3.07 which also is significantly higher from 20.96 ± 2.66 from pre-training test analysis. Also, there is significant increase in total scores from pre-training test 20.84 ± 3.8 to post-training test 29.74 ± 4.3. The average scores on P2 among male students in post-training test was 27.7± 5.36 which is significantly higher from 21.19 ± 3.88 in pre-training test analysis. Similarly, among female students post-training test score is 27.79 ± 2.45 which also is significantly higher from 20.39 ± 3.80 in pre-training test analysis. Moreover, there is significant increase in total scores from pre-training test 20.84 ± 3.86 to post-training test 26.73 ± 4.32. Hence, the Null Hypothesis $H_{0,1.4}$ gets negated.

11. Impact of learning styles on post-training test scores

The Table 20 shows the post-training test scores on Knowledge about simple SW projects dynamics (P1) and Knowledge about difficult project management issues (P2) of students. They have been classified among different styles of learning so as to analyze the patterns separately among male and female students. ANOVA has been performed for finding out significant differences in various learning styles on post-training test scores and in both male and female students. Null Hypothesis $H_{0,1.5}$: There was no significant difference between the post-training test scores on both the issues among students categorized according to their preferred choice of learning. The analysis of the Table 20 showed a significant difference in post-training test scores of those categorized according to various styles of learning. It is found that the maximum score on P1 and P2 among those students who like to learn through Web are 30.75 and 28.85, through class lectures are 30.36 and 28.72 and through group work are 30.63 and 28.42 respectively whereas the minimum scores among students who liked to learn through textbooks are 22.18 and 19.40 respectively. It is further find that among the female students there is no significant difference as observed in post-training test scores on both the issues. Among those categorized according to various styles of learning as on average their scores

Table 19. Paired T-test analysis of pre–post training test scores among students

	Male		Female		Total	
	Pre-Training Test	Post- Training Test	Pre- Training Test	Post- Training Test	Pre- Training Test	Post- Training Test
P1	21.10±2.58	28.86±4.67	20.96±2.66	30.88±3.07	20.84±3.8	26.74±4.3
p-value	0.002		0.000		0.000	
P2	21.19±3.88	27.7±5.36	20.39±3.80	27.79±2.45	20.84±3.86	26.73±4.32
p-value	0.000		0.000		0.000	

Table 20. Impact of learning styles on post-training test scores

		Reading Textbooks	Class lecturers	Group Work	Web Based	p-value
Male	P1	21.74±5.46	29.75±3.56	29.90±4.04	30.69±1.86	0.002
	P2	18.98±5.88	28.94±3.60	28.60±4.69	29.96±1.65	0.001
Female	P1	31.50±0.70	31.44±3.16	31.44±2.78	30.81±3.11	0.842
	P2	28.50±0.07	28.33±2.12	28.22±2.04	26.23±2.45	0.875
Total	P1	22.18±5.71	30.36±3.46	30.63±3.49	30.75±2.55	0.002
	P2	19.40±6.08	28.72±3.11	28.42±3.59	28.85±2.36	0.000

are in the range of 30.81-31.50 and 26.23-28.50 on both the issues respectively. In the results of post-training test, total scores on both issues show that the male students who have scored differently (because of their learning styles on both the issues) i.e., learning through Web (30.69 and 29.96), class lectures (29.75 and 28.94) and group work (29.90 and 28.60) respectively whereas the minimum scores are due to learning through textbooks i.e., 21.74 and 18.98 respectively. As per the female students who scored differently (because of their learning styles on both the issues) i.e., learning through Web (30.81 and 26.23) class lectures (31.44 and 28.33) and group work (31.44 and 28.22) respectively whereas the minimum scores are due to learning through textbooks i.e., 31.50 and 28.50 respectively. Hence the Null Hypothesis $H_{0,1.5}$ is proved to be true.

12. Conclusion

In order to assess the impact of usage of VLE on the learning outcomes and to perform a gender analysis, a questionnaire based survey was carried out twice (once before training and then post-training on SESeLE) on a set of 392 students of higher education of courses related to the areas of IT and Computer Science/Applications. These subjects were made to respond on the issues like their practical knowledge of software handling, interest and knowledge in software project management and impact of e-learning on their knowledge in software project management. The most preferred style has been found to be the web based learning style among female students and it was found to be the second most preferred style of learning among male students. Reading textbooks was not significantly popular among female students as compared to male students. About half of the students agreed to participate in any kind of seminar on software project management. On the knowledge about typical patterns observed in software project management issues in students, the post-training test score was also found to be significantly increased from pre-training test scores. ANOVA test was performed to find out the significant differences in various learning styles on post-training test scores overall and that too in both male and female students. We proposed five null hypotheses in all in this research paper. On the basis of the acceptance of the 1st Null Hypothesis $H_{0,\ 1.1}$, we can say that there is no significant difference between the average response of the male and female students on all issues related to their Interest in Software Project Management. On 2nd Null Hypothesis $H_{0\ ,1.2}$, we found that the pre-training test scores of the male and female students on both the problems are significantly different from the post-training test scores. As the 3rd, 4th and 5th Null Hypotheses i.e., $H_{0,1.3}$, $H_{0,1.4}$ and $H_{0,1.5}$ have found to be negated, we can conclude that the post-training test scores of male and female students on both the issues of simple and difficult software project management were significantly different; the pre and post-training test scores of the students on both the issues were different significantly; and lastly, significant difference was found between the post-training test scores on both the issues among students categorized according to their preferred choice of learning. The authors are, at present, contemplating to carry out this analysis on larger set of learners/students in order to be in position to generalize some of the findings.

13. References

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