2010

TELT educational technologies pilots: brief summary of findings

Semester 1, 2010 results

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INTRODUCTION

In 2009 UNSW undertook a large organizational effort related to the evaluation and adoption of new educational technologies at the institutional level. The result of this effort was a generic evaluation framework underpinning the technology selection and adoption process. The TELT (Technology Enabled Learning and Teaching) Evaluation Framework has three stages, and Stage 3 of this framework is directly referring to the educational technology evaluation by staff and students.

This brief report describes the results of the Stage 3, sub-layer 1 TELT Evaluation Framework activities. Stage 3 initiates an ongoing educational evaluation cycle, first to ensure the targeted technology application (or solution/s) complies with the established criteria (and subsequent inclusion or exclusion from the TELT platform) and second, to evaluate the learning effectiveness of the approved educational technology to align with the need to enhance and improve online learning and teaching practices at UNSW. Stage 3, step 1 is mainly designed to evaluate the educational usefulness and value (the usability) of a technology application, tool, or solution. Stage 3, step 1 activities include primary quantitative data collection, i.e. staff and student surveys. The survey discussed in this document has been completed during Semester 1, 2010. The survey instrument, its creation and refinement are discussed in the other document - *Refinement of TELT survey instrument.*

The survey was developed following the guidelines of the TELT Evaluation Framework and draws on developments presented in *Evaluation of the TELT Platform - Essential Elements and Methodologies and TELT Evaluation - A Multi-Definitional Approach to Educational Technology Evaluation at UNSW; Stage 3 Evaluation Criteria* documents.

This summary is aimed at providing a valuable snapshot of the University community attitudes, opinions about technologies and an objective evaluation of the technologies, in this case the Moodle and Wikispaces applications. More specifically, it seeks to estimate students/staff prior technological experiences and some of the personality features and draft students/staff profiles based on these data. Secondly, it will report the findings from the technology evaluations *adjusted* for learners' prior technological experiences. This approach will allow for the development of unbiased (objective) estimates of technology ratings within the current institutional context. Finally, the summary will provide baseline data against which future comparisons can be made to monitor changes and improvements.

This summary presents the findings from Moodle and Wikispaces Evaluation surveys starting from the discussion of the respondent sample and the different groups of learners participating in this survey, proceeding with general descriptive findings broken down by subscale (descriptives) and continuing with question-by-question response analysis. Note that the Wikispaces analysis is presented in comparison with the general patterns of Moodle responses since the Wikispaces sample is not sufficient to make independent conclusions. The final part of the summary contains recommendations related to the use and implementation of Moodle and Wikispaces at UNSW.

LIMITATIONS

The present summary was not designed to be a cross-institutional comparison study in that no other institutions were involved in the Evaluation activities. Nor were there available usability data or agreed standardized evaluation responses from other institutions, although some Australian institutions have undertaken the effort to evaluate their educational technologies (LaTrobe and Monash universities, for example). Nonetheless, TELT Evaluation Framework instruments have been anticipated to provide a rich collection of evaluation data and are also designed to guide future evaluation activities in comparable institutions across Australia.

STEP 1 MOODLE PILOT (S1 2010).

LOGISTICS

During the semester (Semester 1, 2010), the instructors employed a blended learning approach to supplement classroom instruction with online resources and activities provided on a Moodle course site. Students completed an online anonymous Evaluation survey during the final four weeks of classes. The survey remained available two weeks after the end of the semester.

PARTICIPANTS AND THE SCALE

Moodle, an open-source learning management system was piloted in 16 courses representing 760 students and 10 staff members from 4 different faculties (COFA, FASS, Science and Engineering). We have received 277 responses (36.4% of the total) which considered a typical response rate for a mailed out survey while electronic surveys are cautioned against as having a lower response rate (Gay & Airasian, 2003). Respondents were required to express their degree of agreement or disagreement with each statement by selecting one of the following seven Likert scale options: *1 – Strongly Disagree*; *2 – Disagree*; *3 – Somewhat Disagree*; 4 – *Neither Agree or Disagree*; *5 – Somewhat Agree*; *6 – Agree*; and *7 – Strongly Agree*. Respondents were also invited to contribute non-mandatory short qualitative feedback alongside any particular statement.

PARTICIPANT GROUPS

The survey was intended to be a generic evaluation tool reflecting learners' and staff opinions and perceptions of educational technologies. To this end, the traditional gender and ethnicity-related questions were intentionally omitted from the survey questionnaire as our main goal was not to specifically make detailed comparisons of different staff and student populations and their technological proficiency or their resistance to implied institutional authorities but rather to gather an empirical data in regards to the features of educational technologies under evaluation. Thus, the breakout on learners groups described below reflects only some of the learners personality traits and learners' prior experiences with educational technologies, the latter being considered one of the most important if not THE most important factor in learners' evaluation of technologies (Hong, 2002; Kim & Moore, 2005; Wu, Tennyson and Hsia, 2010)

Six questionnaire items were assessing the respondents' attitudes toward technology (prior knowledge factor). The Likert-scale responses were aggregated to create the overall picture of the respondent sample. The obtained factor distribution is reflected in Figure 1.

With a theoretical overall minimum of 6 (if a respondent were to answer "strongly disagree" to all 6 *attitudes towards technology* questions) and maximum of 42 (if a respondent were to answer "strongly agree" to all *attitudes towards technology* questions), our respondents' population was relatively normally distributed (M = 28.67; SD = 5.4). This normality of the distribution confirms that our respondent population included sufficient variability of people with different levels of prior technological knowledge and could be generalizable to any student population (except for technical institutions students). As such the example of this report could be used by other higher education institutions.

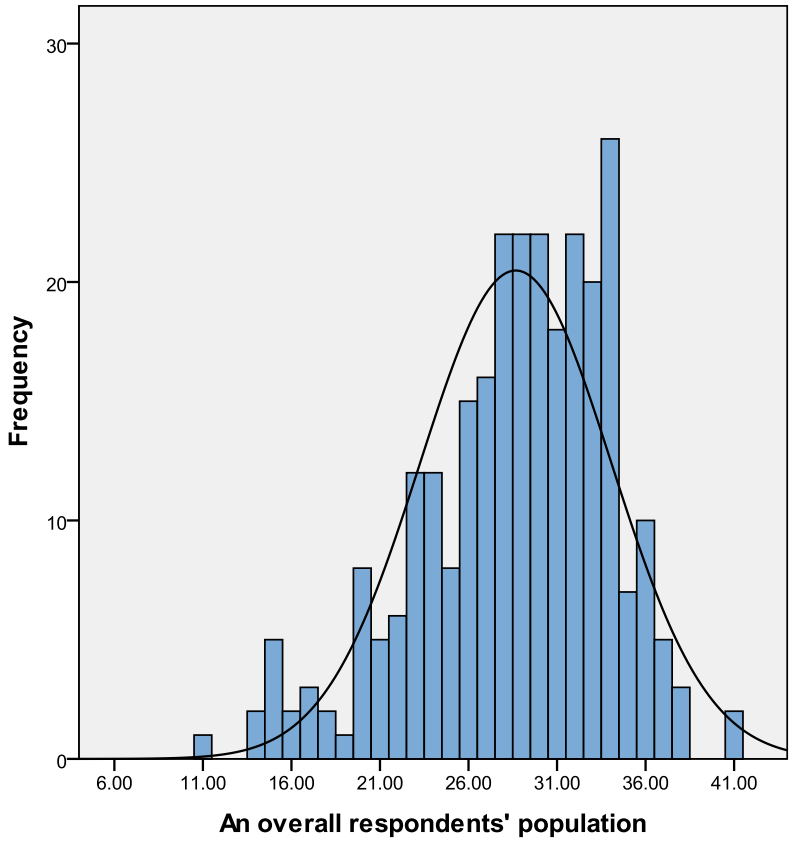

Figure 1: Participant's population by their attitudes toward technology.

For further analysis we took into consideration how well informed our participants are about the Moodle system, using those responses as a multiplier of the original distribution. Based on this aggregate index the participants were then delineated into 3 categories of *low prior knowledge*, *average* and *high prior knowledge* based on the distribution.

The rationale behind such division was that the opinion of a relatively knowledgeable person with a strong background in this particular application (Moodle) could be considered an expert opinion while the knowledge of a person with high prior knowledge with little exposure to Moodle features could be considered into an expert or an average opinion depending on how advanced the person originally was and how much does this person know about Moodle. Thus, group 2 reflected people falling into +/- 1 SD around the mean interval, while groups 1 and 3 reflected the extremes (< -1 SD and >1 SD).

We also took into consideration one additional aspect of the learners' population, including their personality type – being the degree of how opinionated they self-assess themselves to be. Answers to the personality question showed a slightly skewed distribution with $M = 4.56$ (the original Likert scale was 1 to 7). Thus, 2 additional groups – *low prior knowledge and opinionated* (Group 4) and *high prior knowledge and opinionated* (Group 5) were distinguished based on this parameter. These divisions are represented in Figure 2.

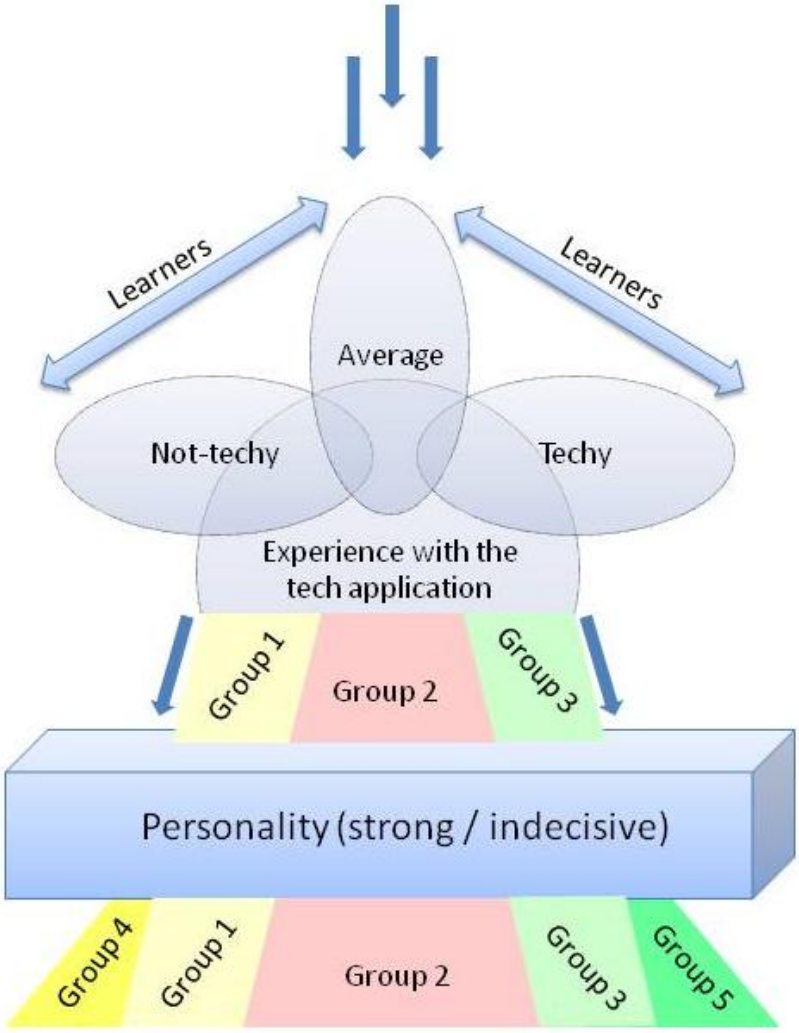

Figure 2: Graphic representation of different learner groups

In summary:

- **Group 1:**
  non-opinionated respondents of a low prior knowledge

- **Group 2:**
  average respondents with an average scoring on both technology usage and personality traits

- **Group 3:**
  non-opinionated respondents with a high self-assessed rating of technology usage

- **Groups 4:**
  opinionated respondents who had a low self-assessed rating of technology usage

- **Group 5:**
  opinionated respondents with a high self-assessed rating of technology usage

The breakdown on groups was designed to assess different needs of the different students' populations in regard to the GUI (emotional appeal of technologies) and in regard to technologies flexibility.

GENERAL FINDINGS (DESCRIPTIVES)

The survey instrument (see *Refinement of TELT survey instrument* for a description) consisted of five subscales reflecting the following dimensions:

- Usability
- Feelings toward an application
- Resistance to implied authorities in relation to one's teaching and learning
- Preconceived notions about eLearning
- Flexibility of application in relation to the teaching and learning

Means and standard deviations of the different learner groups are presented in Table 1.

Table 1: Means and standard deviations for subscales by participants groups (*N* = 277)

Scale	Groups means (standard deviations)					
	Group 4	**Group 1**	**Group 2**	**Group 3**	**Group 5**	**Total**
1. Usability evaluation	3.29(1.07)	3.71(.93)	4.67(.95)	4.85(1.32)	5.14(1.03)	**4.51(1.11)**
2. Feelings toward an application	3.36 (1.21)	3.66(.77)	4.5(1.11)	4.72(1.52)	5.8 (.74)	**4.43(1.23)**
3. Resistance to implied authorities	3.67 (1.43)	3.52(.92)	4.14 (.94)	4.64(1.43)	4.75 (.67)	**4.12(1.06)**

in relation to one's teaching and learning*						
4. Preconceived notions about eLearning	3.64 (1.19)	3.69(1.1)	4.66(1.05)	5.02(1.04)	4.93 (1.2)	**4.54(1.04)**
5. Flexibility of application in relation to one's teaching and learning	4.31 (.77)	4.19(.82)	5.24 (.75)	6.06(.49)	6.25 (.66)	**5.2(.91)**

* reverse scale

General results of our study demonstrate higher ratings for the flexibility of Moodle in relation to one's teaching and learning. The total rating on the *flexibility* subscale is even higher than the *usability* subscale results or *feelings toward an application* subscale results. At the same time it is also visible how much preconceived notions about eLearning influence the learners' opinions. The final findings demonstrate that the total rating for learners' resistance to the institutional authorities is somewhat lower than any other factor. While our learners value the flexibility of the technological application, they are uncertain about the institutional reaction to their input and to their unique learning style. Coming out of a school system with its strict curricular limits, university students are not sure how much individuality they are allowed in this new adult world. The importance of including the learners' voices into the evaluation process has already been mentioned in research literature (Alexander & Golja, 2007), but unfortunately this inclusion often confines students to the role of an end recipient of the delivered educational services, where all decisions are made without their input as in the case highlighted in Britain and Liber (2004).

GROUPS DIFFERENCES

There were significant differences between the learner groups for each of the subscales. However, an unexpected finding at this stage of the evaluation was that learners' error experience influenced not only subjective subscales (such as the *emotional aspects of evaluation*) but also many of the objective usability items. Therefore, no independent analyses of the group differences were performed. But all the analyses included error-experience as the second independent variable along with a group membership (see discussion below).

SUMMARY OF GENERAL FINDINGS:

Contextual factors such as students' perception of the flexibility of the system can serve as a "deal breaker" in adoption decisions when one system (i.e. Moodle) could be perceived highly flexible in comparison with the other technologies. The Moodle survey results also indicate the importance of transparent technology evaluation policies and visible outcomes in the institutional context, to inform students that their voices have been heard and their opinion is taken into consideration when technology adoption decisions are made. At the same time, as learners use more and more commercial products in their everyday lives,

average user expectations and requirements towards the "look and feel" of the educational software will approach the market standards of for-profit applications.

STATISTICAL ANALYSIS

The data was analysed based on the division described above: 5 groups of learners (or 5 learners' profiles) were weighted in their answers to the survey questions. The other independent variable that was included in this analysis was learners' experience with errors.

The notion of errors was understood broadly as a sum of technological and instructional design factors, i.e. course design deficiencies, system malfunctions, and even interface inconsistencies could have been perceived as errors. The study reflects the fact that the learners were sensitive to their own personal experience with errors during the pilot. Overall, the results of the study showed that the notion of errors requires further investigation. The next cycle of evaluation pilot will be designed with a thorough classification of the errors types and will include examples of errors to have a better picture of the primary needs of the learners.

ANOVA with 2 independent variables (IVs) - group membership and an experience with errors, and subscales as dependent variables (DVs) was used for a statistical analysis. Post-hoc comparisons were conducted using Tukey's HSD for honest significant difference for groups, since this test allows for evaluating whether differences between any two pairs of means are significant based on a calculated new critical value. It allows for sufficiently controlling for Type I error when multiple pairs of means are compared.

STRONGLY ERRORS-DEPENDENT ITEMS

Two questionnaire items strongly depended on participants' error experience – an item related to the use of help and documentation during the use of application and the perceived relation of the experiencing problems to the overall educational outcomes. These items were analysed separately from the rest of the subscales' items.

It is interesting to note that not-opinionated high prior knowledge participants were referring to help significantly less ($p < .05$) than any other participant groups (that were somewhat similar in their perceptions) – see Fig. 3 for an illustration. Thus, help and documentation question had 2 significant main effects – of the error experience and group membership, and no significant interaction (2x2 ANOVA was employed for a statistical analysis of this item). However, as it was discussed above, all the significance of a group membership was explained by the difference of the high prior knowledge participants group and other 4 groups.

The other item showing the relation of the error experience to the possible problems influencing one's teaching or learning had the only significant main effect – this of the error experience. Thus, the participants' opinions about the impact of the application on one's educational outcomes (i.e. the negative impact, problems) were different depending on their own error experience – which is an important point to make for a future survey redevelopment.

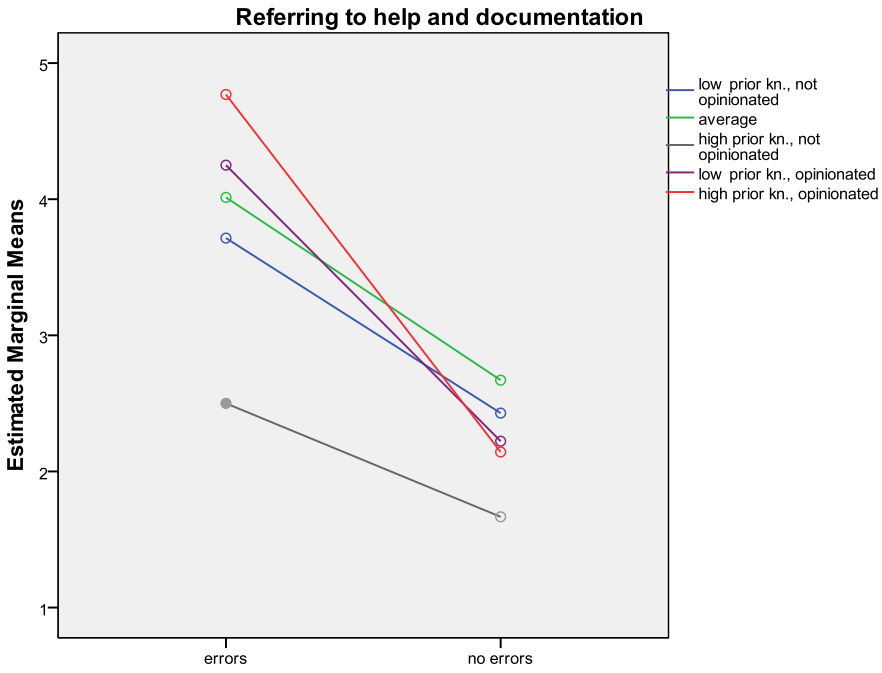

Figure 3: Help referrals by group and error experience

GENERIC USABILITY EVALUATION

In many cases usability experiences are dependent on learners' own level of technological literacy, and knowledge about a particular technology. Similar to the Dawson and Macfadyen's (2010) findings where the Blackboard-enhanced course grade could be predicted from the amount of participants own efforts (such as total number of discussion messages posted or number of assignments finished), our participants ratings depended on their own level of technological literacy and knowledge about a specific technology. ANOVA with group membership and an experience with errors, as independent variables and a usability subscale as a dependent variable has demonstrated that both, learners group membership and their error experience, were influencing learners' usability ratings ($p < .05$), however there was no significant interaction of learners error experience and their group membership.

Originally, the usability subscale was expected to be rather objective and not influenced by errors experience; however, all the learners were consistently rating application usability lower when they experienced errors. Tukey's HSD test was performed for the group membership to distinguish which learners groups significantly differ in their ratings of usability. With the group membership we found two clusters of groups that differed significantly in their ratings. Groups 1 and 4 (low prior knowledge opinionated and not opinionated learners) rated usability significantly lower than groups 2, 3 and 5 (average, high prior knowledge opinionated and not opinionated learners). There were no significant differences in ratings between the groups within a cluster: no differences between groups 1 and 4; and no differences between groups 2, 3 and 5.

This cluster pattern repeats when we take a look at the individual usability items. In particular, questions about the application's look and feel (Q10); the alignment of the way information and resources are organized within Moodle with one's preferred way to organise resources(Q13); the ability to quickly perform different tasks with the help of the application (Q16); the smooth integration of the application with one's own teaching or learning approach (Q25); being positive while having the application as a part of the learning and teaching process in a particular course (Q27), and perceiving the application as useful for other students or staff (Q28) were perceived somewhat similarly by average, high prior knowledge opinionated and not opinionated learners, i.e. any differences between these three groups were not significant. However, all the above-mentioned groups significantly differed in their perception of the situation from low prior knowledge opinionated and not opinionated learners (see Fig. 4 for an example). Average, high prior knowledge opinionated and not opinionated learners rated the system significantly higher on the described dimensions. Remembering that the basis for the division to these groups was not only personality characteristics or a technical knowledge but also the level of the familiarity of the participants with a current system, the recommendation for improvement of the current perceptions of low prior knowledge opinionated and not opinionated learners would be to

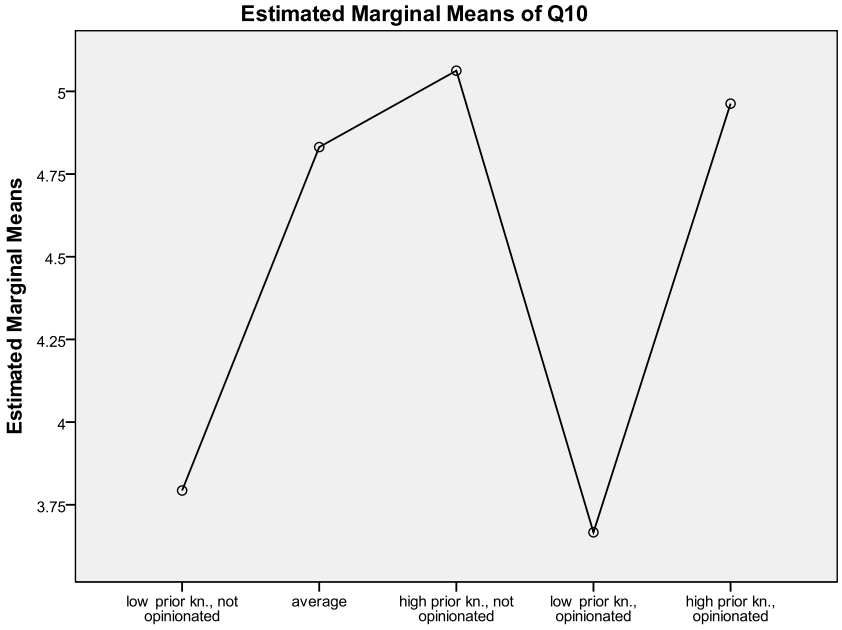

Figure 4: An example of typical usability item

provide enough information about the system to these types of learners.

Participants' errors experience was a significant factor in their responses to many usability items (as it was discussed above) except perceiving the application being useful for other students or staff, which confirms the fact that participants were trying to be objective in their responses to this item. Errors experience was also a marginally significant factor in regard to the alignment of the way information and resources are organized within Moodle

with one's preferred way to organise resources and the ability to quickly perform different tasks with the help of the application. Thus, although participants were trying to be objective, in many cases their own errors experience was an important factor on the way they evaluate the usability of the application. In an ideal case scenario, usability evaluation should be free of personal likes and dislikes and should reflect only effectiveness and efficiency of the technological tool, so the notion of the errors should be further researched in order to better understand the nature of subjective vs. objective factors in future studies.

Some items depended more obviously on the level of the learners' technical knowledge. In particular, an item referring to the consistency of the application to the learner's previous usability experience with other software and websites (Q11) had significantly different responses only between high prior knowledge opinionated and average learners on one side and opinionated low prior knowledge learners on the other side. High prior knowledge and not-opinionated low prior knowledge learners were in the middle in their responses to this item, and no significant differences were observed between them and the other groups mentioned above. This result can also be explained by the way of this questionnaire item was formulated (the point that is further discussed in *Refinement of TELT survey instrument* document).

A similar pattern was observed for an item asking participants whether they consider the application as having or not having certain problems (Q19). The two groups of high prior knowledge and average participant significantly differed in their view of the problems compared to the opinionated low prior knowledge group. High prior knowledge opinionated and not-opinionated low prior knowledge learners were in the middle in their responses to this item, and no significant differences were observed between them and the other groups mentioned above. This questionnaire item was also very errors-dependent, i.e. the response pattern changes drastically based on the fact participants have experienced an error, especially for a low prior knowledge group (see Fig. 5). A particular recommendation for any staff members having a low prior knowledge learners population would be to carefully examine any course resources and activities they use in an online component of the course in order to avoid simple errors such as problems with upload or similar.

It is interesting to note that the question about clarity and intuitiveness of searching, finding and accessing information via Moodle (Q15) was perceived differently even by technologically advanced group of learners (see Fig. 6 for an example). Opinionated high prior knowledge participants and participants with an average level of technological knowledge were considering the information search less intuitive than not-opinionated high prior knowledge learners ($p < .05$ for a post-hoc comparison with opinionated high prior knowledge learners; $p < .05$ for a post-hoc comparison with average learners). At the same time, similarly to the previously discussed items, all these three groups were significantly different in their opinion from low prior knowledge and opinionated low prior knowledge learners. Another explanation of those findings might be related to the nature of the learners' groups themselves: not-opinionated high prior knowledge learners might perceive certain things as being unclear and somewhat irrelevant but they have an extensive experience with other applications and comparing to these other applications Moodle search processes are relatively well defined.

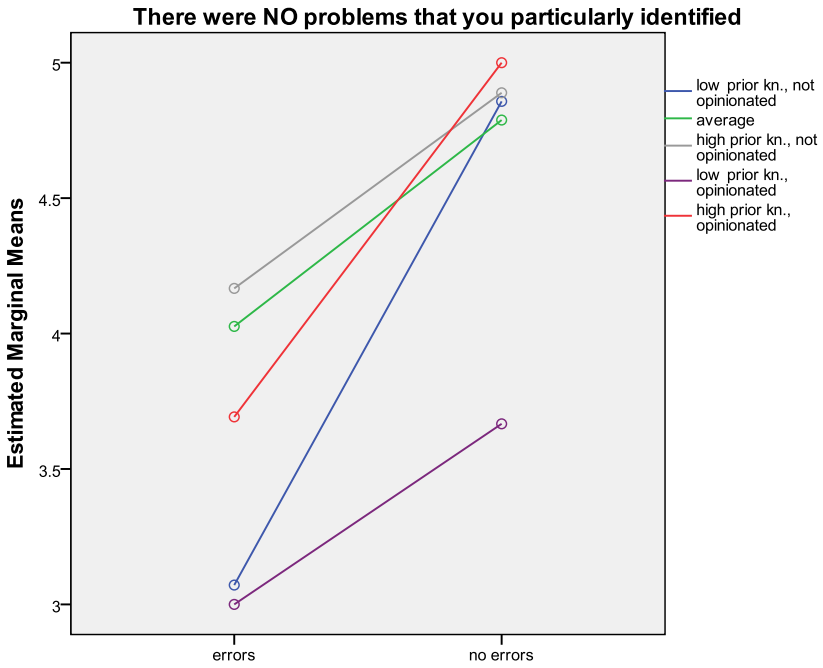

Figure 5: differential influence of error experience on low prior knowledge learners

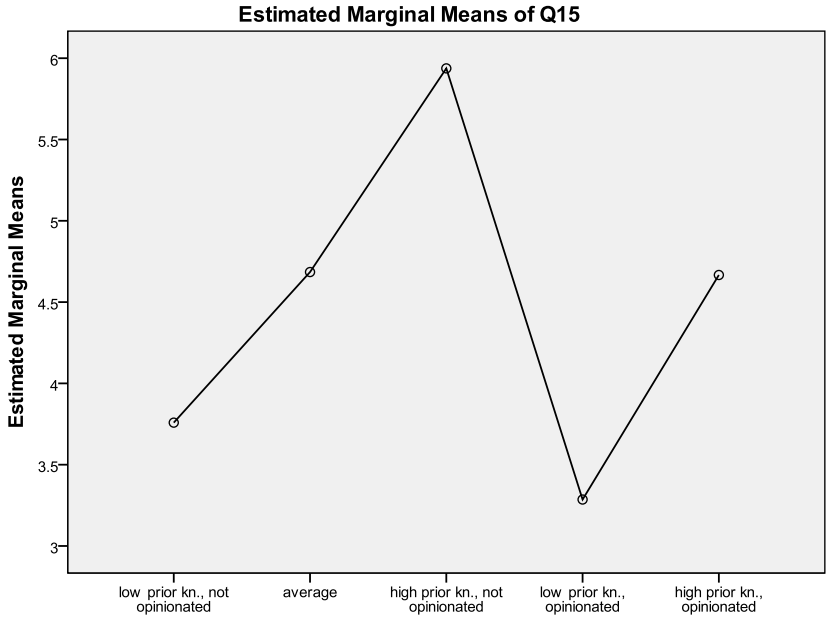

Figure 6: An example of differentially perceived usability item

SUMMARY OF USABILITY FINDINGS:

Error experience was a significant factor influencing the answers to all generic usability questions, although this was not one of the expected outcomes. However, this outcome has raised some additional concerns about the notion of errors in learning management systems (LMS) and in higher education courses. It has provided a good example of how much the evaluation of a technology and learners overall perception depend on the learners actual experiences with the technology, emphasizing the need for a comprehensive staff and student voice in technology evaluation.

Many of the usability items (Q10, Q13, Q16 etc.) were perceived somewhat similarly by average, high prior knowledge and opinionated high prior knowledge participants, which indicates that there are no particular problems with these aspects of the application except for working on an overall level of students' technical literacy.

The other finding is related to the intuitiveness of searching, finding and accessing information via Moodle. This survey item received a highly positive rating only from the high prior knowledge learners; opinionated high prior knowledge learners and average learners were somewhat less enthusiastic. Thus, the development of effective processes and design considerations behind searching, finding and accessing information via Moodle require additional attention from course instructors and educational designers.

FEELINGS TOWARD AN APPLICATION (EMOTIONAL ASPECTS OF TECHNOLOGY EVALUATION)

We have employed the same statistical procedure for this subscale as for the usability subscale. We have used ANOVA with group membership and experience with errors as independent variables, and feelings toward an application subscale as the dependent variable. Similar to the general usability items, participants' errors experience was a significant factor in their responses to all emotions-related items. However, this trend was expected (in difference of the usability evaluation where more objectivity would be expected from learners). The second independent variable, group membership, was also a significant factor influencing participants overall ratings of their feelings about the application. There was no significant interaction of the error experience and group membership. Post-hoc Tukey's HSD analysis of the group membership revealed three clusters of responses significantly different from each other. Low prior knowledge learners had the lowest ratings of feelings towards the application, significantly lower than average and opinionated high prior knowledge learners (all $p < 0.05$). Average and opinionated high prior knowledge learners were, in turn, rating their feelings significantly lower than not-opinionated high prior knowledge learners (all $p < 0.05$). Within these clusters learners groups did not differ significantly in their opinions.

The same cluster pattern appears for the individual items analysis. Atypical items with 3 significantly different clusters prevail (see Fig. 6 for an example). The emergence of these atypical items can be explained by the situation when opinionated and average learners understand the technological value of the application (see Generic Usability Evaluation section) but their emotions about the application are somewhat unsettled in the way they compare it to ultra-modern designs such as trendy tablet systems. Items 14 and 12 in particular reflect this statistical pattern (an item asking how tedious it is to access

information and resources using Moodle, and an item referring to the application as completely irrelevant and distracting for one's teaching or learning processes, respectively). These items showed that opinionated high prior knowledge learners and learners with an average level of technological knowledge were considering the process more tedious and the application more irrelevant than not opinionated high prior knowledge learners ($p<.05$ for a post-hoc comparisons with opinionated high prior knowledge participants; $p<.05$ for a post-hoc comparisons with average learners). There was also a significant difference between opinionated high prior knowledge learners and learners with an average level of technological knowledge mentioned above, and low prior knowledge and opinionated low prior knowledge learners (all $p < 0.05$).

The other two items with three groupings and a significant difference only between the "extremes" – the highest and the lowest opinions - were the questions about feeling apprehensive in using the application (Q26) and the question about the level of the application's integration with one's learning and teaching (Q21). In considering being apprehensive and seeing applications' features and content as being integrated with one's learning and teaching, not-opinionated high prior knowledge learners were significantly different from high prior knowledge and opinionated low prior knowledge learners; opinionated high prior knowledge participants and average learners were somewhere in between in their perceptions of the situation.

It is interesting to note that the question about using help and documentation, discussed in the error-dependent items section, loaded on the feelings toward an application factor. Learners perceived help-seeking as a somewhat emotional procedure (response?). In some sense the response pattern for this item (see Fig. 3) resembles the answer to the hypothetical question of what makes a professional professional – dedication and hard work... That is, spending their time to learn the system and correct the errors instead of just following the manual possibly helped this participants' group become experts.

SUMMARY OF EMOTIONAL ASPECTS FINDINGS:

As was expected, emotional aspects of the application evoked a stronger response from opinionated learners (especially opinionated high prior knowledge learners), than their less opinionated colleagues. Qualitative responses to this subscale show that the learners were somewhat overloaded with information: "I ignore stuff I don't use"; "I only followed the links the applications i needed to go to"; "Too many ways to display the info"; "Different features suit different courses, but you should almost never use all of them". As we can see, learners' feelings about the application are somewhat mixed. Coupled with a total mean of 4.43 (Table 1), the staff and student emotional reaction to Moodle is rather positive, although certainly not at the top of the scale. It should be noted, however, that course design issues (that will be explored on Stage 3, step 3 TELT Evaluation Framework in 2012) seem to influence the feelings about the application in addition to the features of the application itself.

WHO ARE OUR LEARNERS?

While the previous section reflected technical and emotional aspects in the use of the application, the current section helps creating a complete picture of who our learners are,

what experience with eLearning technologies they had in the past and how informed they are about their own learning and teaching styles. It includes an analysis of two survey subscales conducted in the same way as the previous subscale analysis (which included testing the significance of error experience on participants' ratings). Thus, we employ ANOVA with group membership and experience with errors, as independent variables, and the new subscales as the dependent variable(s). Otherwise, an experience with errors is excluded as independent variable to increase the power of analysis.

RESISTANCE TO IMPLIED AUTHORITIES IN RELATION TO ONE'S TEACHING AND LEARNING

The *Resistance to implied authorities in relation to one's teaching and learning* subscale highlighted learners' personal traits many of which were dependent on learners past experiences and were not particularly related to their present experience with errors. Thus, encountering errors did not play a significant role for items of this subscale (p = .17) except for a question about an understanding of one's unique teaching and learning styles by the institution (Q30). Therefore, the items analysis (ANOVA) included only one independent variable – group membership. Groups differed significantly in their total resistance to the implied authorities (p < 0.001). Post-hoc Tukey's HSD analysis of the group membership revealed three distinct clusters of responses. Low prior knowledge opinionated and not opinionated learners had significantly lower resistance than high prior knowledge opinionated and not opinionated learners (all p < 0.05). Average learners were in the middle in their responses and not significantly different from low prior knowledge opinionated and high prior knowledge opinionated and not opinionated learners. The only significant difference for average learners was with low prior knowledge not opinionated learners (p < 0.05).

As it was mentioned above, an understanding of one's unique teaching and learning styles by the institution item (Q30) was unique in a sense that it was influenced by learners' error experience. But the main effect of the error experience (p < .05) was accounted for by differential responses of one group - the opinionated high prior knowledge group (M = 3.92 for those experiencing errors and M=5.57 for those not experiencing errors). In turn, the main effect of the group was manly accounted for by the opinionated high prior knowledge group and opinionated not high prior knowledge group difference (p < .05), see Fig. 7 for an example. The participants' responses to the above-mentioned question demonstrate that although opinionated low prior knowledge group is traditionally critical in their perceptions about how much the institution understand their uniqueness, opinionated high prior knowledge learners' opinion strongly depends on their error experience. In this sense, being highly technology literate and seeking technologically-enhanced courses leads to the perception of the technology-enhanced courses as an integral part of the institution. There is no more division on the institution by itself and technology by itself: they are integrated – at least at the minds of opinionated high prior knowledge learners. Technological error, then, translates into institutional gaffe.

There is no more division on institution by itself and technology by itself. They are the one.

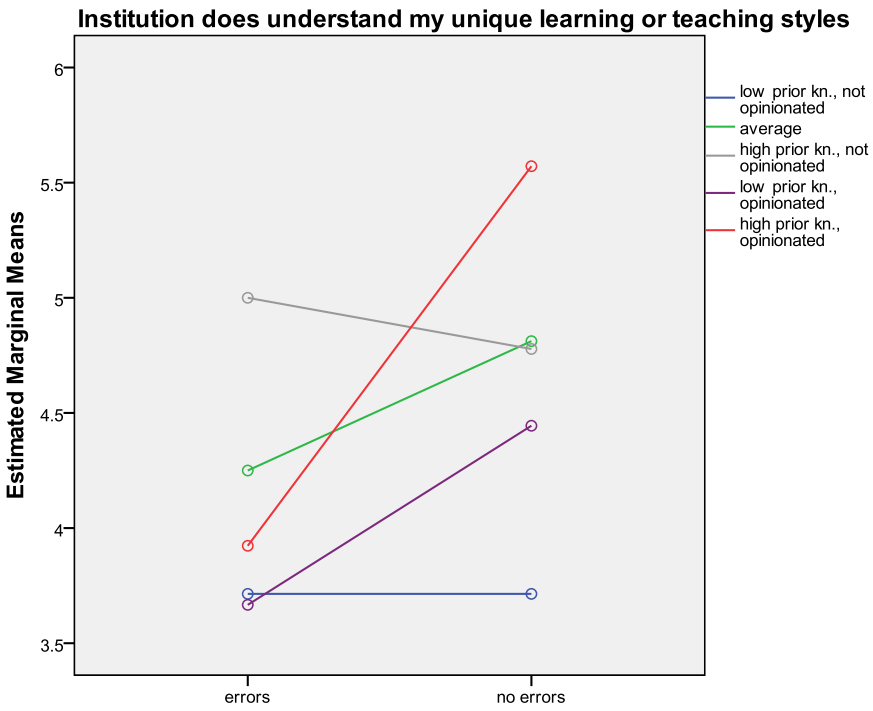

Figure 7: Participants' answers to the item about the understanding of one unique teaching and learning styles by the institution by groups and error experience

The other two subscale items (Q29 and Q8) have the same response pattern as the entire subscale. They are grouped in three clusters with a significant difference only between the "extremes" – the highest and the lowest opinions. Q29 is a question about learners view on changes that will be made in response to the evaluation and Q8 is a question about learners' exploration of the resources and training manuals. Regarding learners view on changes that will be made in response to the evaluation, opinionated high prior knowledge participants were significantly different only from low prior knowledge learners with opinionated low prior knowledge participants, average learners and not-opinionated high prior knowledge participants being somewhere in between in their views. However, overall averages for this item were relatively low: from M = 2.76 for low prior knowledge learners to M=3.96 for opinionated low prior knowledge participants. This finding cautions us against the situation when no substantial changes are made based on learners responses, and ultimately, learners have a little faith in any future changes. Talking about learners exploration of the resources and training manuals, high prior knowledge and opinionated high prior knowledge participants explored significantly more resources than low prior knowledge and opinionated low prior knowledge learners with average learners being somewhere in between. Overall, the means for this item are somewhat average reflecting an overall learners tendency of checking the training manuals sporadically, when the help is needed or a problem arises. Another interpretation of the response pattern for this item comes from the qualitative data. Comments, such as "I'm not sure what this question is relating to", or statements that the respondent used library resources demonstrate a certain

degree of confusion regarding the type of resources mentioned: *course resources* or *training resources*.

Questions about the integration of the application with one's unique learning or teaching approach, and a search for alternative ways of integration reveal the existence of a somewhat inert group of low prior knowledge, opinionated low prior knowledge and (unfortunately) average learners that are significantly different from high prior knowledge and opinionated high prior knowledge participants in that they don't look for challenges with technology. The biggest proportion of the learners (about 84%) turned out to be consumers of technology rather than active participants in aligning technology with their own teaching and learning needs.

The biggest proportion of the learners (about 84%) turned to be rather consumers of technology than active participants in aligning educational technologies with their own teaching and learning needs.

SUMMARY OF RESISTANCE TO IMPLIED AUTHORITIES FINDINGS:

The overall resistance to implied authorities in the Moodle sample is fairly low, with a large proportion of learners being consumers of educational technologies rather than active participants. The other emerging tendency is that the educational technologies are perceived as an integral part of the university, thus the experience with these technologies is seen as a part of the general university experience. Further recommendations for educational administrators would include empowering the existing learners in regard to including their voices in the evaluation process and informing upcoming students about the possibilities of educational technologies.

PRECONCEIVED NOTIONS ABOUT ELEARNING

The *Preconceived notions about eLearning* subscale was tightly related to learners past experiences and was not particularly related to their present experience with errors. Experiencing errors did not (and should not, theoretically, over the short term) influence participants existing opinions about eLearning (p = .91). Thus, the only observed influence was that of the learners' groups. ANOVA with group membership as an independent variable revealed that the level of prior knowledge significantly influenced learners notions about eLearning (p < 0.001). Post-hoc Tukey's HSD analysis of the group membership revealed two significantly different clusters of responses. Average, high prior knowledge opinionated and not opinionated learners were considerably more optimistic about eLearning than low prior knowledge opinionated and not opinionated learners (all p < 0.05). The same groupings were present in individual items analysis. Both questions (Q6 - the value of eLearning in construction of new knowledge and Q7 – in encouraging collaboration) fit under the typical item profiles (see Fig. 4 for a graphic example) with average, high prior knowledge and opinionated high prior knowledge participants being somewhat similar in their opinions about eLearning. All of these learning groups have significantly higher preconceived notions about eLearning than low prior knowledge and opinionated low prior knowledge learners for both items. For example, opinions of average, high prior knowledge

and opinionated high prior knowledge learners mostly rise above average (average being 4 on the 1 to 7 scale), while low prior knowledge and opinionated low prior knowledge participants fall somewhat below average. Thus, the prior technological knowledge shapes learners existing opinions about eLearning.

As a recommendation, different courses, events and even advertisement instruments promoting eLearning seem to be good ways to create a better understanding of eLearning methods for staff and students.

SUMMARY OF PRECONCEIVED NOTIONS ABOUT ELEARNING FINDINGS:

One of the main goals of the new Evaluation Framework is to gain an understanding of who are our learners and what is their current level of technological proficiency to be able to come up with sound organizational recommendations in regard to those learners. If we underestimate their current level or current experiences/expectations, it may have strong budgetary consequences for a university as a whole and will not change the experience / level of satisfaction for students. Improving students' notions about eLearning is an honourable and important long run goal, whilst efforts should be made to consider and attend to the present needs of students with different notions about eLearning, in the short run.

The findings for this subscale suggest that *Preconceived notions about eLearning* largely depend on learners' previous experiences with technology. This result calls for ongoing promotion and integration of technology-related initiatives on campus and for future students cohort.

FLEXIBILITY OF THE APPLICATION

The *Flexibility of the application* subscale was another subscale where we expected learners to be objective rather than subjective. Therefore, we did not expect their error experience to influence the outcomes. While the items in this subscale were intended to assess respondents' understanding of the system (Moodle) the underlying construct uncovered by the statistical analysis could instead be called "opinions about integration and flexibility of the technology applications".

FLEXIBILITY OF APPLICATION IN RELATION TO THE TEACHING AND LEARNING

As expected, experience with errors only mattered for one of the subscale items (question about the level of understanding of the integration patterns), while the other item (flexibility of the application) does not show large difference in responses even between different learners groups. Thus, our discussion is generally related to Q22 (understanding of integration patterns). In this question, students' group membership plays an important role: high prior knowledge and opinionated high prior knowledge learners have significantly higher responses than average learners (all $p < 0.05$), and average learners have a significantly higher level of understanding of how the application, its features and its content should integrate with student learning and teaching than low prior knowledge and opinionated low prior knowledge learners (all $p < 0.05$). It is also interesting to note that both high prior knowledge and opinionated high prior knowledge participants rate their understanding relatively high (M= 6.6 and 6.26 on 7 points scale). As for flexibility of the application (Q24), it was rated high by all learners groups with means ranging from 5.14 to

5.93 on 7-items scale. These high ratings regarding the flexibility of the application are extremely important because they provide us with yet another source of information as for how the pedagogical values can be integrated with the existing technology.

SUMMARY OF FLEXIBILITY OF APPLICATION IN RELATION TO THE TEACHING AND LEARNING FINDINGS:

The flexibility of Moodle and its integration capabilities were rated relatively high by all groups of learners with the total flexibility subscale mean equal to 5.2 (Table 1). Future piloting of LMS educational technologies similar to Moodle is necessary to place this finding into context. However, this preliminary result can give educational administrators a better idea about the strengths and weaknesses of a piloted application, with its flexibility and integration capabilities being particular areas of focus.

STAFF PERCEPTIONS

Only four staff members took part in Moodle survey. They were representing three different groups: 1 low prior knowledge person; 2 average users and 1 high prior knowledge person. Only one (high prior knowledge person) experienced errors. His / her overall usability evaluation is higher than that of the low prior knowledge user but lower than those of two average users. One of the average level of experience staff did not seem to like the application in terms of access to information, identified some other problems (although he / she did not experience any errors) and was not sure that his/her opinion will be taken into consideration. Otherwise, there are no definite conclusions that can be possibly drawn about faculty perceptions based on the small sample size of only four staff participants.

STAGE 3 WIKISPACES PILOT (S1 2010).

We received only 30 responses to the survey questions in Wikispaces pilot, which might be due to the highly individualistic nature of the piloted environment (i.e. creating a good Wiki is somewhat similar to the creation of the Web-site). Therefore, any results obtained for this pilot should be interpreted within the context of a small sample size. The composition of the sample itself should also be considered with caution: our sample had a high percentage of staff members – 30% of the sample, while 70% were students. This is not the traditional breakdown for a university environment. For example, UNSW has about 6000 staff members and 46000 students, totalling in 52000 people on campus[1] which is 11.5% staff members and 88.5% students. The Wikispaces sample is also unique in terms of the high level of participant technical proficiency: the vertical reference line on Fig. 8 reflects the mean of Moodle pilot sample (i.e. typical university population). As we can see, the majority - 87% of Wikispaces population is above this mean (right half of the figure). Moreover, the division by groups similar to the one employed with Moodle sample gave us only 3% of low prior knowledge and opinionated low prior knowledge participants (1 participant) in Wikispaces sample. 60% (!) of the Wikispaces sample would be included in high prior knowledge (27%) and opinionated high prior knowledge groups (33%).

[1] http://en.wikipedia.org/wiki/University_of_New_South_Wales

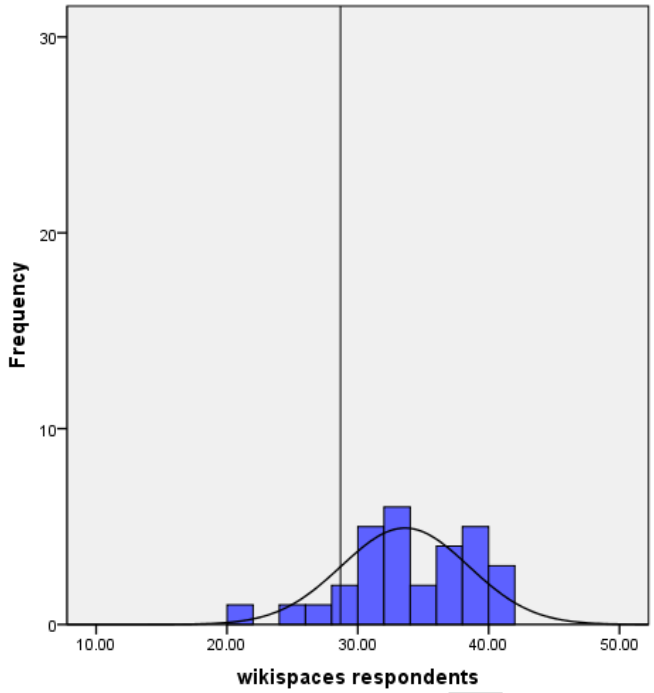

Figure 8: Wikispaces sample by their attitudes toward technology (on Moodle pilot scale).

Taking into consideration the uniqueness of this sample, sample descriptives (and further analysis) include groups 2, 3 and 5 – entirely excluding the one low prior knowledge participant. Means and standard deviations for subscales by Wikispaces participants groups are presented in Table 2.

Table 2: Means and standard deviations for subscales by participants groups (*N* = 29)

Scale	Groups means (standard deviations)			
	Group 2	**Group 3**	**Group 5**	**Total**
1. Usability evaluation	4.97(.72)	4.6(1.18)	4.67 (.89)	**4.76 (.91)**
2. Feelings toward an application	5.16 (.90)	4.62 (1.02)	5.33 (.91)	**5.07 (.95)**
3. Resistance to implied authorities in relation to one's teaching and learning	4.45 (1.01)	5.04(.49)	5.00 (1.4)	**4.80(1.06)**
4. Preconceived notions about eLearning	4.73 (.98)	5.25 (1.19)	5.10 (1.39)	**5.00 (1.15)**
5. Flexibility of application in relation to one's teaching and learning	5.22 (.64)	4.94 (1.12)	5.65 (1.00)	**5.29 (.93)**

In terms of usability, the patterns observed with more technologically literate (Wikispaces) sample are different than those of the Moodle usability evaluation. Average learners actually seemed to give higher scoring to the Wikispaces features than technologically advanced learners. This paradox - mostly high prior knowledge people using Wikispaces, but average learners thinking Wikispaces are more usable - can be explained by the already mentioned fact that the idea of Wikispaces (almost akin to one's own Website) appeals to the somewhat more individualistic learners and technology proficient learners. At the same time technology proficient individuals might see the ratio of the time spent on Wikispaces content development to the final result as not very favourable since they are capable of doing the Web content development on their own and possibly using the other tools. Average learners, on the other hand, do not have multiple means of Web content development and value the opportunity that Wikispaces presents for them.

A similar pattern is observed regarding the feelings toward an application. Whilst the not-opinionated high prior knowledge group is somewhat more reserved in their feelings, the average and opinionated high prior knowledge learners are excited to use Wikispaces.

As expected from the high staff proportion in this sample, the third and fourth subscales – resistance to implied authorities in relation to one's teaching and learning and preconceived notions about eLearning - respectively have higher means than the traditional student sample (Moodle pilot). Staff members value academic freedom and are resistant to outside influences in relation to their teaching.

The fifth subscale, flexibility of the application in relation to one's teaching and learning, shows a somewhat challenging result. While the flexibility of Moodle in relation to one's teaching and learning was rated relatively high by all participant groups, it would be expected that the absence of low prior knowledge groups would make these ratings even higher for Wikispaces, which, however, is not the case. In our analysis of the flexibility subscale results we should rather observe the usability ratings discussed above and speculate that truly technologically proficient learners could have been feeling constrained by the Wikispaces features. That could be why their flexibility ratings (the mean of 4.94 for group 3, for example) are much lower than both average learners ratings in Wikispaces sample and similar technological proficiency group (group 3) ratings of Moodle flexibility (the group mean of 6.06). Overall, each group mean for this subscale in Wikispaces sample is lower than similar groups means of Moodle flexibility.

SUMMARY OF GENERAL FINDINGS:

The Wikispaces pilot had a small sample of 30 participants; thus, any findings and conclusions related to Wikispaces should be interpreted with caution. A larger sample of users is necessary to draw any recommendations for the future, although this may also be difficult due to the individualistic nature of the tested environment. However, we want to highlight several interesting patterns that emerged from the current analysis. First of all, there is a paradox where average learners rate Wikispaces usability somewhat higher than high prior knowledge learners. This suggests targeting average learners and staff when promoting Wikispaces as a technology. If these populations are able to deal with the steep introductory learning curve of Wikispaces they then tend to find Wikispaces more usable

than high prior knowledge learners. Both average and opinionated high prior knowledge learners tend to feel good regarding the use of Wikispaces based on the emotional components. The other interesting finding is that with all the usable and emotionally appealing features Wikispaces are perceived as somewhat less flexible as a technology application than Moodle.

ERROR-DEPENDENT ITEMS

Similar to the Moodle results two questionnaire items strongly depended on participants' error experience – an item related to the use of help and documentation and the perceived relation of the experiencing problems to the overall educational outcomes. However, it should be noted that error experience for Wikispaces sample was more extensive than for Moodle sample with 63% of the participants experiencing some type of an error. Again, the smaller sample and a restricted analysis on only 3 groups does not allow for making any robust conclusions about group differences: no significant main effect of group membership was observed. However, a marginally significant interaction (p=.068) was present for a help and documentation item (see Fig. 9). In this sample high prior knowledge participants' referrals to help seem to be strongly influenced by their error experience while the average learners are somewhat inert.

The survey item - the perceived relation of the experiencing problems to the overall educational outcomes (Q20) reflected a main significant effect of experiencing errors; no other significant effects or interactions were observed.

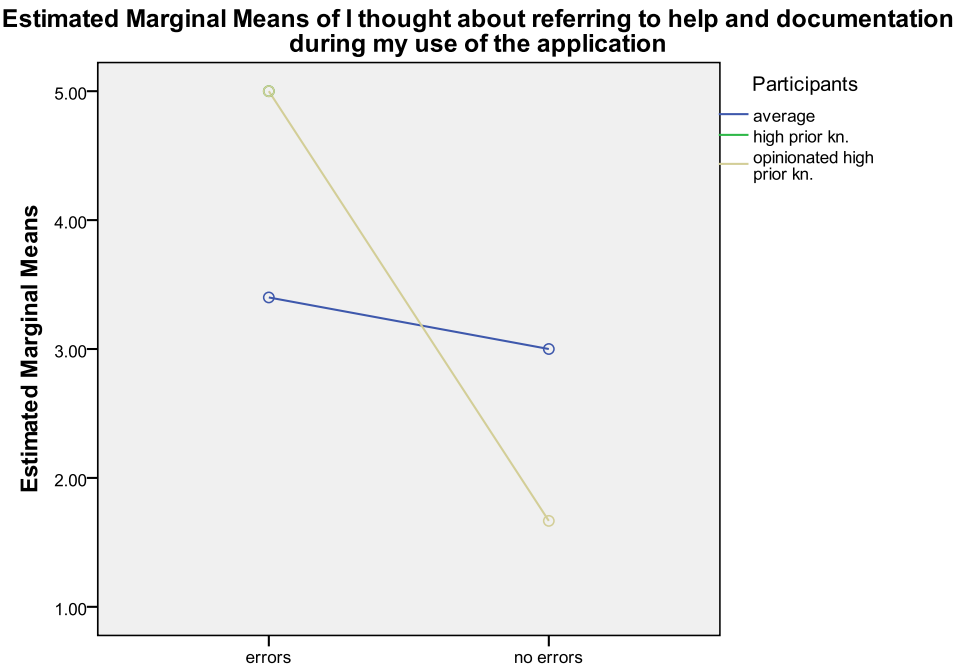

Figure 9: Help referrals by group and error experience (Wikispaces).

QUESTIONNAIRE ITEMS ANALYSIS

The data was analysed based on the division described above: the responses of 3 groups of respondents were analysed in relation to the subscale questions. However, due to the small sample size the only significant difference that emerged was related to the flexibility subscale. The main effect of errors experience ($p < .05$) and the interaction between the group membership and the error experience ($p < .05$) were significant factors influencing the answers to the flexibility scale. No main effect of group membership was observed. Thus, while average learners experiencing or not experiencing errors were somewhat similar in their perception of flexibility, opinionated high prior knowledge learners rated the flexibility higher when they had an error experience and lower than average learners when they did not have this experience. Further analysis revealed that the item that provoked such differential response on flexibility scale was the question about flexibility itself; the question about the integration issues did not reflect significant differences between the groups.

RECOMMENDATIONS

The ongoing piloting of new and diverse educational technologies prior to their institutional adoption by the university for learning and teaching is an important step for the creation of a modern and competitive university environment. This statement contains two points elaborated below. Both these points were informed by the findings from Stage 3, sub-layer 1 TELT Evaluation Framework process:

1. The most technologically advanced students perceive the university and the technologies the university uses as one and the same. In their mind, there is no distinction between the physical educational institution and the technological pathways of interaction and online presence that the institution has developed. Thus, adverse technology adoption decisions could translate into a tarnished, negative perception of the entire university brand, campus environment and educational offerings. By applying the TELT Evaluation Framework we have the early advantage of gaining this insight as the majority of students are still transforming and developing their technological expectations and institutional perceptions, but this stage is coming with the ongoing release of innovative technologies and the increasing proportion of "digital natives" attending the university.
2. The unique differences between the technologies, their suitability for different types of faculties and courses, and the needs of the staff and students themselves should be taken into consideration when adopting these technologies. While the Moodle sample is representative of the student population, the Wikispaces sample, intentionally or not, reflects a different, more technology-oriented, population with a higher percentage of staff members using this technology. Whether this pattern will repeat on step 2 of the pilot remains to be seen.

The introduction of the Stage 3, sub-layer 1 pilot survey allowed for two sets of educational recommendations to be made: a) recommendations for the ongoing further development of the survey instrument itself (further discussed in *Refinement of TELT survey instrument*); b) findings and recommendations regarding piloted educational technologies. It also allowed for illuminating several major insights about the UNSW students population. Those points are covered below:

1) Learners with higher technology expertise tended to rate educational technologies higher and were better able to utilize the existing features of the application
2) Overall resistance to implied authorities in the Moodle sample is fairly low with a large proportion of learners being consumers of educational technologies rather than active participants. More attention should be paid to promoting and facilitating students' unique learning styles within the institutional context.
3) Using a lot of well designed commercial technology applications in their everyday lives learners expect educational technology applications to similarly have a modern design, a rich error-free feature set and a quick and intuitive workflow for completion of different routine tasks.
4) Error experience plays an influential role not only for learners' feelings about an application but also for their assessment of overall usability. Thus, being error-free is

one of the major prerequisites for the success of an application in terms of its perceived potential for adding educational value in terms of its usability and usefulness.

General findings and recommendations regarding piloted educational technologies:

1) Transparent technology evaluation policies should be in place to encourage student participation and to demonstrate visible outcomes from this evaluation in the institutional context.
2) The emphasis should be made on the flexibility of a technology application for different types of learners with the further need of ongoing customization and refinement of the application since the "look and feel" of the educational software will have to be consistent to the market trends and standards of other popular and well designed commercial applications.
3) Search functions, such as finding and accessing information, in Learning Management Systems like Moodle, require further attention and development from the side of course instructors and educational designers.
4) When assessing learners' feelings about the educational technology application, not only should the features of the technology be considered but attention must be paid to the overall integrated course design. Indeed, this is further developed upon and explored in Stage 3, sub-layer 3 of the TELT Evaluation Framework. In brief, the amount and style of information presented to the learners via online course component should be carefully weighted against the on-campus component of the course.
5) Empowering, encouraging and listening to the staff and students voices and experiences in the evaluation process and informing upcoming students about the range and possibilities of educational technologies could serve as two of the long-term strategies underpinning effective ongoing L&T development.
6) Further promotion of innovative technology-related initiatives on campus and for the future student cohort plays a critical role in further technological development and evaluation activities.
7) Targeting average technology-proficient learners and staff when promoting Wikispaces as a technology emerges as another strategy for L&T and TELT. If these learners are able to deal with a steep introductory learning curve of Wikispaces they tend to find Wikispaces more usable and quite emotionally appealing.

These findings will be taken into consideration for further Stage 3 evaluation activities taking place during Semester 2, 2010.

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