

# **Online problem-based learning as a strategy to enhance learner-learner engagement in distance education**

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**ulmage Distance Education Innovation Grant Scheme 2015-2016 Final Report**

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## Part 1. Achievements statement

### Online problem-based learning to engage large cohorts

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**Project Implementation:** February 2015-June 2016

#### Project outputs:

- Production of PBL resources such as cases, tutor guides, student orientation slides, staff orientation slides, assessment rubrics, student survey, ethics application, grant application located on a project Interact Site to be utilised by a PBL reference group<sup>1</sup>.

#### Project achievements and impacts:

- Implemented in three subjects using Adobe Connect: AHT101 (all DE; in 201530 and 201630), AGR202 201560 (a DE subject with ~20 internal students enrolled), and AGB450 (all cohorts).
- 5 PBL cases were constructed<sup>2</sup> using audio visual material and included the development of tutor guides. These can be used in either a face to face or online environment.
- Approximately 334 students completed the online PBL tasks altogether.
- Staff development in DE small group learning processes, facilitation and assessment.
- Student development of IT, groupwork, and communication skills; PBL is especially useful if course coordinators are seeking to improve students' metacognitive abilities.
- Increased student engagement through attendance at online meetings, and regular communication with each other via email or the Adobe Connect meeting rooms, with the majority of students logging into the site at least every day and making a comment or reading other's contributions.
- Development of authentic cases and assessments for DE students.
- Development and validation of an evaluation survey for online PBL engagement factor analysed with 6 scales
- Various opportunities to present our work have resulted in communication and engagement with other schools and disciplines.

*Using Adobe Connect was brilliant – there was an audit trail and tracking of progress; it's a good communication platform (AHT101 Viticulture student)*

*Other people's contributions were inspiring and that motivated me*

(AHT101 EcoAg student)

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<sup>1</sup> The PBL reference group is yet to be established

<sup>2</sup> Only 3 were used

## **Part 2. Executive Summary**

### **Project context**

With a DE student cohort of over 100 students per subject in the core subjects of the School of Agriculture and Wine Sciences (SAWS) courses and high attrition, new models are needed which engage students, motivate them to self-direct their learning, and sustain their motivation over the course to improve student retention. This project used key elements of a problem based learning (PBL) approach, in a scaffolded and supportive online environment, across three core subjects offered in a suite of nine SAWS courses. It was envisaged that a constructive alignment approach using an online PBL method of delivery, scaffolded online interactions with peers, and authentic assessment tasks that aligned with a PBL approach would reduce attrition, enhance student engagement, and provide a framework for consideration by other courses.

### **Project aims**

1. Reduce attrition by at least 5% and increase student engagement as evidenced by retention statistics, SES, SEQ, and CEQ evaluations.
2. Facilitate learner-learner engagement (as per the CSU Draft DE strategy, 2014<sup>3</sup>).
3. Provide a cost efficient framework for the delivery of online collaborative learning using a PBL approach which can be adopted by others.
4. A staff development and student induction regime for the facilitation of online PBL.

### **Project approach**

An action research approach was used in the way that each implementation of the online PBL process was slightly modified for improvement based on student and staff feedback, as well as analysis of the student interaction within Adobe Connect pages. The ways in which the implementation developed over time are illustrated in Table 1, Appendix B. Although the essential features underpinning online PBL remained unchanged, the incorporation of additional elements helped to refine the implementation strategy. The unchanged elements were the use of Adobe Connect and the basic layout structure (included in Appendix C). In each cohort, PBL occurred over a three week period, subject level online meetings (OLMs) were held weekly to provide feedback to each cohort and present an overview of what was expected in the forthcoming week, and students posted Weekly Summaries (or milestones) of their group's progress each week to the subject discussion forum.

PBL cases were purposefully developed by the project officer in consultation with the subject coordinator and drawing on real cases from industry reports or subject coordinator expertise. Tutor guides were developed which included the expected student learning outcomes and responses based on a framework developed by the Sydney Medical School.

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<sup>3</sup> [http://www.csu.edu.au/\\_data/assets/pdf\\_file/0009/1169973/Draft-DE-Strategy.pdf](http://www.csu.edu.au/_data/assets/pdf_file/0009/1169973/Draft-DE-Strategy.pdf)

Staff attended a two hour 'orientation to PBL' training workshop and were provided with lists of relevant discussion questions for each case.

Both subject staff and the project officer checked into the online PBL meeting rooms in Adobe Connect of each group every two days to provide feedback, direction, and support.

### **Project outputs/deliverables/resources**

A project Interact site called "Online PBL" has been created and is accessible by all CSU staff. This website houses all of the material developed over the course of the project, incorporating resources for both students and staff, screen shots of subject sites which used the online PBL, assessment items and rubrics, the survey used to evaluate the experience, presentations arising from the project, orientation material for students and staff, both audio and text based files, case triggers and tutor guides. A complete list of the resources available is included in Appendix D. Most of the resources are easily adaptable for use in other subjects or discipline areas.

### **Impact of project (outcomes to date and projected future impact)**

Distance Education (DE) student engagement using an online collaborative small group framework with scaffolded support and aligned assessment tasks has been successful in getting students to engage with one another and with teaching staff, as well as engaging with the subject content. The experience for internal students is mixed and it is suggested that the project impact and outcomes be read with the view towards application to DE cohorts only.

Staff have been empowered to utilise OLM more frequently and with greater confidence and also have a model with which to engage DE students with tasks and peers.

The main project outcomes are:

1. Enhanced student engagement with one another and subject content in an online environment
2. Development of resources to support students and staff in small group online learning.
3. Student development of group work, communication, analytical, and technological skills – all workplace relevant.
4. Staff engagement with the scholarship of L&T in an online environment – pedagogical and policy implications.

The projected future impact is that more staff engage with this strategy and feel confident to adapt their teaching to utilise small groups in various forms within the Group tools in Interact and with the established assessment rubrics which may reduce marking time. Showcasing the ways in which students can collaborate on a task at a distance from one another may also have potential future implications for subjects and courses with heavy workplace learning commitments and may be especially useful for promoting inter-professional education in the health sciences.

## **Key findings**

1. Collaborative small group work is a useful method to promote student interaction in Distance education and Adobe Connect is a suitable tool to support this in large cohorts.
2. Group based assessment tasks enhance the collaboration of students and a sense of belonging to a discipline area.
3. Student opinion was mixed about their enjoyment of the task and not all students performed well, but the majority of survey and interview respondents, as well as student reflection assignments showed that students commented favourably on the relevance of gaining experience working collaboratively with others, enhanced communication skills, use of authentic assessment tasks, and upskilling of technological literacy and the applicability of all of these skills for the workplace.
4. The learning activity is especially useful if course coordinators are seeking to improve students' metacognitive abilities.
5. Five clear factors emerged from the survey evaluation which was validated through Rasch analysis and triangulated with qualitative data. These factors are: Cognitive engagement, Success factors, Metacognitive behaviours, Collaborative learning outcomes, and Social outcomes and benefits.
6. Results are independent of degree enrolled in.
7. Students who are overcommitted may benefit the most from scheduled, assessed, and scaffolded online group tasks in terms of collaborative learning outcomes.
8. Attitudes towards collaborative learning outcomes are mixed, depending on the extent of participation by others within the group.

## **Key recommendations**

1. Staff and students need a considered lead in time (at least two weeks) to prepare for and adapt to the learning design and technology before commencing work on an assessable task.
2. Staff need to dedicate/protect time at the outset and for the first two iterations.
3. The workload for enhancing engagement in DE modes via group based tasks needs recognition and support by Schools.
4. Two or more iterations within a cohort are recommended before making any decisions about the permanency of this learning activity.
5. Two to three synchronous discussions per week are recommended for students engaged in online PBL to gain maximum benefit from the learning activity.

## • Part 3. Detailed report

### 3.1 Context

With a DE student cohort of over 100 students per subject in the core subjects of the School of Agriculture and Wine Sciences (SAWS) courses and high attrition in those courses, new models are needed which engage students, motivate them to self-direct their learning, and sustain their motivation over the course to improve student retention. This project used key elements of a problem based learning (PBL) approach, in a scaffolded and supportive online environment, across three core subjects offered in a suite of nine SAWS courses. It was envisaged that an online PBL method of delivery, scaffolded online interactions with peers, and authentic assessment tasks that aligned with a PBL approach would reduce attrition, enhance student engagement, and provide a framework for consideration by other courses.

*Overall Aims:*

1. Reduce attrition by at least 5% and increase student engagement as evidenced by retention statistics, SES, SEQ, and CEQ evaluations.
2. Facilitate learner-learner engagement (as per the CSU Draft DE strategy, 2014<sup>4</sup>).
3. Provide a cost efficient framework for the delivery of online collaborative learning using a PBL approach which can be adopted by others.
4. Develop a staff and student induction regime for the facilitation of online PBL.

In the wider context of the Schools of Agricultural & Wine Sciences, information about the three courses in which online PBL was implemented is provided in Appendix E to understand the nature of implementation and factors impacting on the results. It is important to understand that all of these contextual factors in Appendix E impacted on the implementation and evaluation of the project. In addition to subject specific factors, were changes at the School and Faculty levels which resulted in a new Head of School appointment, lack of staff 'buy in' at senior level, and lack of communication across sites.

### 3.2 Approach

The stages and summary of key activities undertaken during each stage throughout the four rounds of implementation are illustrated in Table 2, Appendix F.

### 3.3 Outcomes

- *Resources or outputs that will be made available to the university or groups of stakeholders, including information about where any project material is available;*

A variety of resources has been made available to staff who would like to join the Online PBL Resources project page on Interact. Educational Designer Kerri Hicks will be looking after this site and can be contacted if there are any questions.

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<sup>4</sup> [http://www.csu.edu.au/\\_data/assets/pdf\\_file/0009/1169973/Draft-DE-Strategy.pdf](http://www.csu.edu.au/_data/assets/pdf_file/0009/1169973/Draft-DE-Strategy.pdf)

Some examples of material available on the site include PBL case trigger, tutor guides, student orientation material, project presentations, a PDF of the survey from survey monkey, screen shots of the Adobe Connect PBL meeting rooms, a flowchart of timelines depicting how to prepare for implementing online PBL, and assessment rubrics and item descriptors for group based assessment tasks. A complete list of the resources provided to date (as of 10<sup>th</sup> June) is included in Appendix D.

- *Changes to subjects or courses that have occurred during the project;*

As a result of this project, significant changes occurred in AHT101 DE mode with the introduction of a group based assessment task, removal of the mid-session exam, and the addition of a self and peer assessment task. It is envisaged that this remain a permanent feature of the subject.

With regard to AGR202, this was the first time the subject had been taught via DE mode and so everything that was done was new.

In AGB450, the introduction of a group based assessment task in addition to peer evaluation and an individual written reflection were all new features of the subject. It is envisaged that these features will remain for 2017 implementation, if there is HoS support, with the addition of more staff support in the form of online tutorials reviewing how to analyse data in a spreadsheet (although this is assumed knowledge for the subject).

- *Professional development provided to teaching and/or educational design and support staff;*

All staff involved in the project have participated in a presentation on PBL and orientation to Adobe Connect. In addition, staff have refined their skills in writing and marking group based assessment tasks and rubrics as well as the assessment of written reflections. The use of Adobe Connect in a more structured way, with the ability to provide specific feedback on student performance throughout the task, in a timely manner, has also been a new skill developed.

- *Changes to teaching or design practices that have occurred as a result of the project;*

The weekly Online Meetings which occurred throughout the project were commented upon favourably by students in their weekly reflections and open-ended comments in the survey. They will remain a permanent feature in AHT101, AGR202, and AGB450.

The use of casual staff in AGB450 is critical, and as such, their skill and understanding of the activity is important to maintain and support as students look locally for support and advice in addition to support provided by the subject coordinator from a distance.

Through participation in the project, staff have recognised that rubrics and linkages to peer-assessment need to be clearly defined and easily understood. These assessment items need to be capable of differentiating between actively engaged students and those which don't, at both the output and peer-assessment level. In addition, staff have reflected that mark allocations for group outputs need to be significant in comparison to that under peer-assessment.

Through this experience, staff recommended that, where multiple forms of delivery exist (i.e. internal and DE at different sites) expectations of students need to be made clear, as site statistics indicated variable engagement with resources, some of which were critical to students understanding the expectations of the process and task at hand.

### **3.4 Evaluation and impact**

#### Methods:

Both quantitative and qualitative data collection and analysis approaches were utilised. In the first implementation, a survey was conducted based on a review of the literature surrounding the evaluation of student engagement and online PBL in particular. A number of demographic and



technology based questions were also incorporated to gain an understanding of each respondent's personal learning situation and context. From this first iteration, 89 survey items were included in the first survey. This was added to for the second implementation on the basis of student interview data and more issues for exploration were turned into question items. Once data was collected after the first two iterations of the project, a Rasch analysis<sup>5</sup> was completed. Rasch analysis belongs to the Item Response Theory (IRT) family of models and assumes a probabilistic and logarithmic relationship between a latent trait measured using a survey instrument and a level of ownership or endorsability of the trait by the respondent. The outcome of a satisfactory Rasch analysis is that both the person's endorsability of the trait and the survey items difficulty are expressed using a common linear and additive common scale and that the instrument becomes cohort insensitive.

The original Rasch analysis indicated a strong departure from one of the fundamental assumptions of Rasch modelling. In short, there was no evidence that the underlying trait measured by the survey instrument was unidimensional and this was unexpected as the items included in the instrument were drawn from the body of literature relating to student engagement in the online space. A Principal Component Analysis (PCA) was carried out to identify the multi trait construct. The PCA identified 6 likely traits and reduced the instrument from 64 to 30 items (Table 1, below).

A subsequent Rasch analysis using the entire dataset confirmed the uniqueness of each trait (although the 6<sup>th</sup> was a weak fit). The dataset was coded for 5 demographic factors: Gender (Male; Female), Subject (AHT101v1; AHT101v2; AGB450; AGR202), Degree (12 degrees were coded as Factor levels), Commitment (Less than 20 hr per week; more than 20; Borderline; Over Committed) and Number of Discussions (1 per week; 2-3; 3-4; more). In each trait, some disordered behaviours were observed (i.e. in some items, students were not able to clearly differentiate between a "somewhat disagree" and a "neutral" response). These items were rescored and the new analyses clearly fitted the final validation of the Rasch model.

*Table 1 Description of the 6 dimensions identified using a PCA analysis and validated using a Rasch analysis per dimension*

Factor	Name	Number of Items	Meaning
1	Outcomes of cognitive engagement (or task based outcomes)	10	The nature of the online PBL cases allowed the students to construct new knowledge but they also identified a new strategy for learning.
2	Success factors (positive mediators for engagement)	7	The experience was challenging but the manner in which it was designed was conducive to engagement.
3	Participation; metacognitive behaviours	5	The students felt comfortable in actively participating in discussions, including asking or providing help to a peer.
4	Collaborative learning outcomes	7	As a group, the students were satisfied with the strategies used to create a final product, including the number and quality of discussions. Overall, the group felt like it was functional.
5	Social outcomes and benefits	3	As an outcome of the experience, the group members

<sup>5</sup> Rasch, G. (1960). Probabilistic models for some intelligence and attainment tests. Copenhagen, Danmarks Paedagogiske Institut.

			feel that they have created a level of friendship that extends beyond the task itself.
6	Collaboration <sup>6</sup>	3	The group members consistently and actively contributed to the group discussions during the PBL case.

The original survey with open-ended comments and demographic items is included as Appendix G. Also included in Appendix G is Table 3 which provides a break-down of the items comprising each factor.

At the conclusion of each of the three week PBL period students were informed about the nature of the research study in the last OLM and via an announcement and sent a link to participate in the online survey administered via Survey Monkey. After two reminder emails (one from the project officer and one from the subject coordinator) a response rate of 65% was achieved (n = 55/85) in AHT101, and 44% (31/70) in AGR202, as well as 45% in AGB450 (34/76), 49% (46/93) in AHT101 v2<sup>7</sup>.

In the weeks following on from the conclusion of each case study, students were sent a request to participate in a structured interview about their experiences of online small group work, with 12 students from AHT101 participating in a 30-40 minute interview prior to the end of Session 1, five from AGR202 in Session 2, and five from AGB450, and 3 in AHT101 v2. Subject coordinators from all three subjects were also interviewed in the second half of Session 2 and first half of Session 1, 2016 for AGB450.

Data has also been incorporated, with permission, from the student's final reflections in the third week of the online task. These were written reflections completed within the Adobe Connect meeting rooms for each group. Students were to comment on how their group worked in the final week, how might their group work more effectively next time, how well did their group remain on task overall, and they were also asked to identify ways in which they could, as an individual, contribute more effectively.

## Results:

### *Respondents*

The survey response rate varied from between 45-60% across all four implementations, with complete survey data available for 166 students, or 50% of all students who experienced the online PBL task. In addition to the survey data, 25 students and 4 staff were interviewed. Data is available for extensive qualitative data analysis using the Community of Inquiry theoretical framework applied to posts from chat rooms and student final reflections and this may be the subject of follow up publications. Lack of time has not permitted the analysis of this type of data for this report but will be analysed for peer reviewed publications. Overall, the triangulation of subject surveys, student

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<sup>6</sup> This dimension re used one item from a previous dimension. It fitted weakly with the Rasch model and was therefore removed from subsequent analyses.

<sup>7</sup> AHT101 v2 refers to the second implementation of online PBL in 201630, as distinguished from the first implementation in 201530.

and staff interviews, along with posts in the online PBL rooms provides a powerful approach to interpreting complex issues such as online learner engagement in group tasks.

A snapshot of the main results from a combination of survey and interview data is reported here, with a more detailed and descriptive report available on request.

#### Respondent demographic characteristics

- 53% Male overall
- 56% reside in a large or small rural town; 33% live in a Capital city or Metropolitan region;
- 81% DE enrolled
- 28% BABM enrolled; 17% Wine Science; 16% Agriculture (These were the most common course enrolments for AHT101 both iterations)

These demographic characteristics are broadly representative of the nature of the cohorts for these courses and in these modes.

#### *Access to technology*

Over 50% of all respondents had reliable access to technology and accessed the internet daily, engaging with the PBL task and the Adobe Connect platform at home (88-95%) using a laptop (60-74%). Respondents favoured communication by personal email (80-85%) and valued the regular online meetings (OLM) throughout the course of the online PBL task.

On the whole, students commented favourably on the technology and the workplace relevance of learning to use the technology within a group task. Students specifically liked the weekly group summaries, OLMs, and feedback. These results are broadly in line with the results of CSU's Learning Technology Surveys<sup>8</sup>.

The main problems identified by students were that only one student at a time could take charge of the layout and that if one student changed layouts it changed for everyone. A minority of students also commented on poor internet connections, the busyness of layouts, difficulty in not having a microphone and the plethora of communication tools available which led to confusion at times.

### **Results from the Rasch Analysis**

The survey administered to students aimed at measuring their engagement with the Online PBL tasks. The Rasch analysis revealed 5 clear sub traits (factors). Results from the survey and qualitative data from interviews, open-ended comments on the survey, and comments from student's final reflections in the online PBL rooms will be reported here in sections which correspond to the five factors resulting from the Rasch analysis. The individual factors together with their corresponding survey items are illustrated in Table 3, Appendix G. Broadly, positive and negative Logit values indicate endorsement and rejection of a trait respectively. Typically, a scale ranges from -3 to +3.

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<sup>8</sup> [http://www.csu.edu.au/\\_data/assets/pdf\\_file/0007/1396285/SurveyReport.pdf](http://www.csu.edu.au/_data/assets/pdf_file/0007/1396285/SurveyReport.pdf)

Negative to positive Logits indicate that students displayed little to large amount of the measured trait.

## Overview

The results in Table 4, Appendix H, provide an overview of the mean person location scores for all respondents, as well as a breakdown of those mean scores by subject, gender, commitment level of students, degree enrolled, and number of synchronous weekly discussions held within groups. Please note that the Rasch analysis identifies if an item displays Differential Item Functioning (DIF), i.e. the quantitative evidence that a group of respondent (such as Male vs Female) consistently responded to the item in a different manner. Presence of DIF would suggest that respondents “understand” the item differently and would require a specific item for males and another for females (or the item to be removed). This is different from observing a significant difference in mean response between groups. There was no DIF in any of the 5 instruments.

*On the whole*, the results from all respondents show that question items from Factor 3 (Participation/Metacognitive behaviours) were the easiest to answer and were endorsed more favourably by respondents.

Survey items comprising Factors 1-4 were all positively endorsed by respondents, although to a lesser extent than Factor 3. In contrast, items from Factor 5 were negatively endorsed. This suggests that respondents found these items difficult to agree with, and as such, suggests that indicators of social outcomes and benefits of the online PBL activity may be more appropriately evidenced by qualitative data such as open-ended questions and interviews<sup>9</sup>. Qualitative data from the project shows that connecting with and learning from others was one of the main themes when students were asked about the benefits of participating in the task.

When the overall results are investigated against *subject level* (or iteration of the online PBL activity), several trends in Table 4, Appendix H are clear. Firstly, respondents from the final iteration, AHT101 v2, had the most positive endorsement of 3 of the 5 factors (F2; F3 and F5). We suggest that this may be a result of the greater confidence with which staff implemented the online PBL activity and the benefits of having done three iterations and taken previous student feedback into account to make modifications to the learning design each time.

The results in Table 4, Appendix H show significant *gender* differences in how respondents answered the survey items. This difference was statistically significant ( $p < .1$ ) for Factor 2 and Factor 5, where although respondents from both genders negatively endorsed the survey items, male respondents were more negative than female respondents. The significant difference in responses to items in Factor 2 may suggest that overall, males are somewhat more sensitive than females to the design factors of the PBL tasks and how likely they are to lead to a positive experience.

In terms of *commitment* based on hours of paid employment and number of subjects concurrently studied, respondents working less than 20 hours per week in paid employment, and completing one to two subjects tended to respond more favourably to items comprising Factors 1, 3, and 4. Those

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<sup>9</sup> We do have evidence of social outcomes and benefits in the qualitative data set and this will be incorporated into a peer reviewed publication due to time and reporting constraints

categorised as being overcommitted, on the basis of working more than 20 hours per week and studying three or more subjects concurrently more positively endorsed items from Factor 2, and not surprisingly, more negatively endorsed items from Factor 5. These differences were not statistically significant however and the results in Table 4, Appendix H suggest that there is no need to group the findings on the basis of Commitment in any future analyses; it does not contribute towards an explanation of the results.

There were no statistically significant differences in responses to the survey on the basis of *degree* enrolled in but there were some trends. Students enrolled in the Viticulture and Wine course responded more favourably to items from factors 1 and 2, whilst MABM students responded more favourably to items from Factors 3, 4, and 5 and were one of the few cohorts who had a positive response to items from Factor 5. Neither *Commitment*, nor *Degree* have any statistically significant impact on the person mean response in any of the five dimensions and grouping the findings on the basis of these variables is not recommended in future analyses.

As some students alluded to in their open-ended comments and interview responses, the *number of synchronous discussions* held as a group each week positively impacted on self-reported learning outcomes, and the survey responses support these comments. As shown in Table 4, Appendix H, for example, two to three synchronous discussions each week seems to be optimal, with students engaging in this number of discussions reporting more favourable endorsement of items across all factors. This was especially true for Factor 2, where statistically significant differences were found between those engaged in 2-3 discussions per week and those engaged in just one discussion ( $p < .05$ ), and also for Factor 4 ( $p < 0.1$ ). Interestingly, and somewhat of an anomaly, is the finding that those who engaged in 3-4 discussions per week reported the most negative endorsement of items relating to social outcomes and benefits (Factor 5). This suggests that there may be a threshold at which the number of times group meet synchronous can positively impact on learning.

*In summary:*

- The project team got better at implementing the online PBL learning activity over time;
- two or more iterations within a cohort are recommended before making any decisions about the permanency of this learning activity;
- the learning activity is especially useful if course coordinators are seeking to improve students' metacognitive abilities;
- male students are particularly more responsive to items comprising Factor 2 – aspects of the project which positively mediated student engagement, i.e. 'success factors' such as the tutor, the PBL case, and regular OLMs (mean = 0.9), more so than the cohort as a whole (mean = 0.7);
- results are independent of degree enrolment;
- two to three synchronous discussions per week is recommended for students engaged in online PBL to gain maximum benefit from the learning activity.

## Results from Factor 1: Outcomes of Cognitive Engagement

The overall results for Factor 1 survey items shown in Figure 1<sup>10</sup> illustrate that survey respondents were predisposed to agree, or positively endorse, the items measured in this factor, as indicated by the positively skewed person-item threshold distribution histogram. The results in this figure also show that few items were difficult for participants to endorse, shown by the small number of positively distributed item bars in Figure 1<sup>11</sup>.

On examination of the results for this factor by subject (or iteration of the online PBL task), Figure 2 shows that AHT101 respondents in both iterations found the items relatively easy to agree with, and positively endorsed items, in comparison to respondents from AGR202 and AGB450. Respondents from AGB450 had the least agreement with the items from this factor and were least engaged in the task cognitively. This aligns with the overall impression from subject coordinators and from interview respondents and open-ended survey comments which show that the implementation in this subject was not as smooth as the other subjects due to the spread of participants across sites and modes of enrolment. This lack of agreement by AGB450 respondents is also significant given that there were few items perceived as difficult to endorse on the whole, meaning that the responses are more likely to be due to participant's experiences in AGB450 rather than the interpretation or difficulty of items to answer.

Positive distributions were found when scores were examined on the basis of gender, commitment, course enrolled and number of synchronous discussions – all distributions were generally positive (see Figures 3-5), indicating that levels of agreement with the survey items in Factor 1 was strong, and the items were not difficult to endorse. Figure 6 shows that two to three synchronous discussions per week is optimal for producing a stronger attitude towards cognitive engagement as a result of participating in the online PBL task.

*In summary:*

- Items on the Cognitive Engagement scale were easy to endorse;
- Respondent attitudes towards Cognitive Engagement in relation to online PBL were positive;
- The positive distribution of results for AHT101 cohorts suggests that the subject is a suitable one in which to implement online PBL, perhaps as it is an introductory level subject and the early introduction to group work and an authentic task is favoured by respondents.

From the analyses of open-ended questions on the survey, the **best features of the online PBL task and/or case** related to the social learning and experiential aspects of group work and connecting with others, and the knowledge creation and skill based components associated with learning new skills and using new technology.

Categorisation of **how the PBL case could be improved**, revealed three core categories: Organisation, structure and guidance; Technology and communication related; and Group structure and dynamics. From the staff perspective, greater focus could be provided on the content to ensure students don't

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<sup>10</sup> All Figures are in Appendix H

<sup>11</sup> Items to the right of zero are more difficult to endorse

explore too widely and one staff member also commented on the need for the case to be geographically relevant to the student location.

### **Results from Factor 2: Success Factors**

The overall results for Factor 2 show a positive spike in attitudes at the lower positive threshold and then a sharp drop for remaining logits. In contrast, there was a greater spread of attitudes on the negative end of the person-item threshold distribution and overall, showed an almost opposite distribution to Factor 1, with attitudes less positive on the whole, although the items were not perceived to be difficult to answer, as shown by the histogram in Figure 7.

On closer inspection, by subject, the distribution in Figure 8 shows that respondents from the AHT101v2 iteration had the strongest and most positive attitudes towards the items in Factor 2, and respondents from AGB450 had the least positive attitudes; this pattern also aligns with that of Factor 1, indicating some consistency in attitudes by these two cohorts.

The distribution in Figure 9 shows a clear difference in attitudes towards the items in the Factor between respondents who engaged in one discussion per week as opposed to those who engaged in two to three discussions per week, with respondents in the latter category having more positive endorsement of the items than those in the former category. This also aligns with the mean scores reported in Table 4, Appendix H which showed that this difference was statistically significant at the .05 level.

*In summary:*

- Having 2-3 discussions per week is critical to having positive attitudes towards success factors impacting on the online PBL activity;
- Items on Factor 2 were not difficult to respond to on the whole;
- It takes time to foster Success Factors, with the second iteration within a cohort showing the most positive distribution of responses to the items.

### **Results from Factor 3: Metacognitive Behaviour**

The distribution of perceived item difficulty and odds for agreement with, or endorsement, of items shown in Figures 10-15 suggests that items in this Factor were the least difficult to respond to and attitudes were most positively skewed overall (Figure 10), across cohorts/iterations (Figure 11), and across gender (Figure 15).

Figure 11 illustrates that the students participating in the first iteration of the PBL cases in AHT101 (v1) was similar to that of the AGR202 and AGB450 students. In all three cases, it was the first attempt by the academic to implement the PBL cases. When the cases were implemented a second time (AHT101v2), the students reported improved metacognitive engagement; they felt comfortable in actively participating in discussions both synchronously and asynchronously, including asking for help or providing help to a peer.

Differences in ratings of attitudes towards Metacognitive Behaviours seemed most apparent for the overcommitted group, but were statistically non-significant. This is because the overcommitted group was significantly larger than any other group. This suggests that even when overcommitted,

the students felt comfortable in engaging with the discussion. The level of commitment therefore is unrelated to the discussions themselves.

The distribution shown in Figure 15 provides further support for the encouragement of groups to engage in synchronous online discussions at least once, if not 2-3 times per week, with those respondents showing the strongest endorsement of items. Importantly, the results shown in Figure 15 suggest that meeting more frequently than three times per week does not appear to have any additional benefits toward metacognitive behaviours.

*In summary:*

- The online PBL activity had a positive impact on the metacognitive behaviour of respondents;
- The greater the experience of academics in running a PBL session, the greater the student engagement in metacognitive behaviour.

### **Results for Factor 4: Collaborative Learning Outcomes**

The results for this factor show a bimodal distribution in Figures 16-18 with low frequencies for item difficulty. This was true overall, across subjects, and across gender, and suggests that respondents had mixed attitudes with regard to items comprising this Factor. When the open-ended comments and interview data were examined a possible explanation for this may be the varied participation of students within groups, where some groups had high participation of most group members whilst other groups had only limited participation, and even that by only a minority of group members.

In terms of commitment, the distribution in Figure 19 shows a trend again for those classified as overcommitted to rate the items on this factor more positively. Perhaps those who are overcommitted have less time to forge collaborative relationships with peers and the online PBL task provides a vehicle for this to occur in a scaffolded environment which may be appreciated to a greater extent by those in this category compared with those who are less committed, more likely to be internally enrolled, and who have other avenues in which to work collaboratively with peers.

The results in Figure 20 show that respondents who engage in just one discussion per week with their group tended to report more negative attitudes towards collaborative learning outcomes, in contrast to those who met two to three times per week and who had more positive attitudes. This again supports the idea of recommending groups meet two to three times per week online to foster and build collaborative learning outcomes; assessing participation helps to encourage students to engage in group meetings.

In the survey, comments in relation to **group dynamic and structure** included the need for groups to arrange their own meeting times, the need to have more people participating, smaller groups, and make the first meeting compulsory attendance with a tutor present.

When asked **what would have helped their group to work better**, most of the 166 survey respondents, as well as the 25 interviewees, answered that time management was an issue and having regular, sustained contributions by group members and having a regular and scheduled



meeting time as a group would have enhanced the group work. This was also a common theme in the Final Reflections.

Responses from *interviewees* show that participation was enhanced through having others in a group dependent on the individual to bring back the research they were responsible for, and having a sense of being relied upon. One student commented that the regular staff and student contact filled a void left by not having a residential school. Although ten of the interviewees across all cohorts indicated that they became more focused on the task over time, as they became more comfortable with the group and the task, eight said that participation dropped off due to exams, work, lack of group participation, lack of clarity, and lack of internet connectivity, and five stated their participation remained consistent. This variability in responses suggests that it may be useful to add an additional question into the survey to evaluate more widely for this<sup>12</sup>.

*In summary:*

- Groups need to meet synchronously two to three times per week to gain maximum benefit from collaborative learning outcomes;
- Students who are overcommitted may benefit the most from scheduled, assessed, and scaffolded online group tasks in terms of collaborative learning outcomes. Time management is a critical success to Online PBL;
- Attitudes towards collaborative learning outcomes are mixed, depending on the extent of participation by others within the group.

### **Results from Factor 5: Social Outcomes and Benefits**

The distributions shown in Figures 21-26 have the widest spread of scores on attitudes for the survey items in Factor 5 compared with previous factors. There was also a wide and even spread of scores in relation to item difficulty in these figures.

Figure 22 shows that respondents from AHT101 tended to respond more negatively to the survey items on this factor, whilst those from AHT101v2 had more positive responses. As shown in Table 4, Appendix H, this difference was statistically significant ( $p < .05$ ). The results shown in Table 4 also illustrate that social outcomes and benefits progressively improved with each iteration of the learning activity. Although the mean scores are small, the trend for improvement in scores is clear, with statistically significant ( $p < .05$ ) differences between each subject/iteration.

In a similar fashion to Factor 4, the trend shown in Figure 26 reveals that respondents who engaged in just one or 3 to 4 discussions per week with their group were more likely to respond negatively to survey items in Factor 5 compared with those who engaged in two to three discussions per week. This suggests that 2 to 3 discussions are optimal.

*In summary:*

- Respondent opinions were mixed in relation to the social outcomes and benefits of engagement in the online PBL task;

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<sup>12</sup> For example, by asking them to comment on how their participation changed over the three week period

- On the basis of experience in AHT101, cross cohort responses to items on this survey appear to improve over the number of iterations;
- Results again show that two to three discussions per week within groups leads to more positive attitudes in relation to the survey items and factor.

### **Staff specific feedback**

The factors staff thought were crucial to the success of this type of project were:

- Clarity and confidence on topic boundaries – it can't just be about process;
- More preparation and groundwork is required to educate students on what a ground rule is, what a product is, what a hypothesis is;
- Greater clarity around marking of participation/content is needed;
- Greater engagement of colleagues and senior management in the process;
- Accounting for the extra workload involved with OLM and student interactions;
- Staff orientation.

Factors which were felt to constrain the project success were the disciplinary content silos and competition for assignments, lack of staff 'buy in', lack of time, and competing demands amongst internal and DE students. Staff interviewed indicated that they spent approximately two hours per night, three times per week in addition to normal working hours, on implementing the task over the three week period.

Factors identified as contributing to future project success were:

- Staffing and workload allocations;
- Training in the development of case studies;
- Training in the production of tutor guides;
- More time being allocated to the task.

For the next implementation, staff suggested that they would provide greater clarity about the output required of students, provide more examples, and be clearer on the marking. One staff member who was teaching DE and internal cohorts concurrently in the same subject suggested it would be nice to be able to concentrate solely on the DE cohort, and both AHT101 and AGR202 staff suggested ways in which the layouts of the PBL rooms could be improved with greater simplification of the pods and terminology used.

Staff would give the following advice to future staff members considering their involvement in online PBL:

- Have significant training in Adobe Connect;
- Clear your diary for the three weeks allocated; ensure you have the time to commit and don't overload yourself outside of it;
- Learn how to manage the interaction between concurrent internal and DE cohorts;
- It is an experiential exercise – be prepared that some students may not 'get it' until they experience it;
- Be clear about the marking procedure.

*Limitations:*

*Factors which had a negative impact on the project included the following:*

- Lack of cohesive views on pedagogy within the school;
- Geographic dispersion of sites limiting communication at times;
- Staff availability and workloads; lack of preparation and lead in time for some staff;
- Implementing the learning design in subjects which span multiple sites, modes of enrolment, cohorts and courses was overly ambitious in hindsight.

## **Overall**

*Future plans:*

1. Prepare students for working in groups. What we did was not enough (one x one hour ppt lecture) – they need to know the practicalities of group structure and function, the importance of roles, allocating and respecting a leader, participating regularly and following through.
2. Have a check list for group leaders to run through each week comprising: Have you agreed on the next meeting date and time? Has each person been assigned a task? Has someone been allocated the job of putting up the weekly summary? Has there been a deadline set for comments on the weekly summary before it is posted? Has the next meeting date been advertised?
3. Allocation of roles, regular weekly meetings, and timing of the case are all critical features.
4. Consideration will be given to making the first OLM group meeting at the beginning of the task compulsory and completed with a lecturer facilitating the discussion
5. More integrated assessment design which comprises of three components: group output, individual output and peer-assessment, with significant marks awarded for the first two components and group output weighted by peer-assessment.
6. Further plans for data analysis of discussion posts using a Community of Inquiry (CoI) framework.

*Impact so far:*

- Scale of impact in terms of the number of students, staff and courses positively impacted by the initiative

A total of 334 students have now experienced the initiative, 9 staff altogether across sites, 8 courses, and 4 subjects have been positively impacted by the initiative. In addition, the project has been presented at CSUEd and at various L&T and ulmage forums over the course of 18 months. Feedback in the form of queries via email and telephone from staff in other schools such as Environmental Science, Physiotherapy, and Clinical Science suggests the impact on staff has extended more widely than we can formally account for.

## **3.5 Engagement, dissemination and sustainability**

*Sustainability of strategies trialled*

The use of PBL and Adobe Connect were two strategies used concurrently to promote learner-learner engagement. A significant number of resources, including cases, tutor guides, Adobe Connect meeting rooms, staff and student orientation to the technology and pedagogy have been developed and can be utilised and transferred to other courses when and if applicable. To this end, the strategies can be up-scaled to other disciplines and schools if there is enough lead-in time to prepare for the initial implementation, and if staff are willing to engage with the strategy and have the time and support of senior staff to do so.

#### *Sustainability of resources developed*

There are a number of resources made available on a project interact site which can easily be utilised when needed. There is also a survey tool which has been developed and validated for small group online learning which can easily be adapted and used by staff. These resources require little to no maintenance.

#### *Sustainability of changes implemented*

Two of the three staff involved in the project envisage the changes implemented in AHT101 will remain, with minor modifications. The subject coordinators feel confident enough to implement the online PBL task on their own with future cohorts, utilising the available resources and with the support of Educational Designers. The third staff member involved does not feel the task is sustainable in its current format whilst being heavily committed to teaching the subject to internal and DE cohorts concurrently.

#### *Strategies used for engaging with others across faculty and university*

The promotion of the project by ulmage through the website and newsletter, and opportunities to present our progress and work at different seminars facilitated by ulmage have been the principle strategy utilised to engage with others across faculty and the university. We have also had the opportunity to present our work to other ulmage project teams and at CSUEd conferences. This has led to phone calls and emails from staff from other schools to inquire further about what was involved.

#### *Dissemination of results and outputs*

The results have been disseminated so far through the ulmage website and Interact project site as well as small group seminars and the CSUEd conference in 2015. Two draft publications are in progress – one a theoretical paper and the second a methodological paper where the survey instrument is the focus. The design and development of a valid and reliable survey for measuring student engagement in online group based tasks is one of the major outputs from the project.

#### *Future opportunities for wider implementation of outcomes*

With the development of resources and repository of information on the project Interact site, it is hoped that staff in other schools may be encouraged to consider implementing similar strategies using Adobe Connect and that some joint research ventures may ensue. With the push for greater numbers of postgraduate courses to be offered by DE for current undergraduate health sciences

subjects in particular, there is real potential for the outcomes of this project to have wider applicability and implementation outside of the School of Agriculture and Wine Science. It is hoped that publication of results in peer reviewed journals may also create future opportunities for implementation and collaboration with others.

#### *Future plans for sharing outcomes within and beyond the university (plans for publications)*

Publication of the survey design, development, and implementation/validation is expected in Computers and Education (Impact Factor 2.8) or Assessment and Evaluation in Higher Education (Impact Factor 1.07).

Publication of the Online PBL implementation and theoretical analysis of student posts using a Col framework is expected in The Internet and Higher Education (Impact factor 2.7).

Opportunities for the presentation of the project at ASCILITE are being investigated.

#### *Linkages between the project and other ulmagine projects or pilot subjects*

There is potential for linkages between this project and the Riverina Shore – with cases and scaffolded facilitation available using Adobe Connect to be utilised as part of the Riverina Shore experience.

*The potential for the initiative to lead to future internal or external grants should also be discussed in this section.*

There is potential for the results from this project to inform the grant writing process in applying for a CSU Learning and Teaching Grant to implement Online PBL using the already developed resources in another school or partner institution. Together, these results could be used to apply for a large scale Inter-professional Workplace Learning project where students out on placement have the opportunity to engage with each other on a relevant case and exchange their workplace experiences. This would be especially useful for students out on placement in rural or remote areas and who otherwise might feel quite isolated from the university and from other students.

### **3.6 Wider implications**

Evidence suggests that facilitated online collaborative student activities can lead to improved critical thinking, increased motivation and autonomy, and engaging and effective learning experiences (Crawford, 2011). An online PBL format can reduce the sense of isolation that some students may experience (Graham & Scarborough, 1999), and depending on the technologies and resources available, may lead to student immersion in a topic, enhancing motivation, knowledge retention, lifelong learning, and higher order thinking. The results illustrated in this report, and other qualitative data we will incorporate in peer reviewed publications, show further evidence to support this literature.

In particular, computer mediated technology has been shown to make collaborative learning achievable when face to face communications are difficult (Zhang & Peck, 2003); can be used to support reflection (Lee, 2006; Savin-Baden, 2007), promote higher order thinking (Zhang & Peck, 2003), and empower students to have more active control over the learning process, which in turn,

increases motivation to learn. Of particular relevance to CSU is that the online learning environment has been shown to improve the quality of the learning experience for remote students and encourage DE students to engage in a wider range of activities than would otherwise be possible, including group writing tasks for example (Bower et al, 2014). This was certainly the case in our project in which students collaborated on an assessable, high-stakes group task, with survey and interview results showing high agreement that collaboration had occurred, engagement with subject content occurred at a deeper level than would otherwise be possible, and students had the opportunity to engage with the task and with others in a way that had not previously been possible.

The choice of synchronous versus asynchronous communication is a common theme in the online PBL literature, with most studies recognising that although synchronous communication might be preferred, the pitfalls in terms of speed of communication, technology drop outs, scheduling difficulties and poor management when there are too many participants (e.g. Cheaney & Ingebritsen, 2005) lend more support to the use of carefully managed and well-structured asynchronous communication tools such as discussion boards. As a result of this literature we purposefully designed the Adobe Connect meeting rooms for both synchronous and asynchronous discussion, with explicit instructions, multiple layouts each week, and clear ways identified to progress through the case with associated tasks identified for completion every 2-3 days. We unexpectedly found that students were enthusiastically engaging synchronously as groups in Adobe Connect as well as on Facebook, further promoted when group composition was based on geographic location so that they were all in the same time zone. The strategic design of the meeting rooms did not detract from this at all but did increase the flexibility of the experience so that those who were not able to join in synchronous discussions could still participate to a high level. The results from this project will inform the literature about the expectations and requirements needed to succeed for combined synchronous and asynchronous interactions using online PBL, and in particular, the value of assigning students to clear roles, expecting students to engage in 2-3 meetings a week with their group, and the benefits of having a microphone to achieve a greater amount of work and decision making in a relatively shorter amount of time.

The scale of this project is unprecedented in the literature, and extensive reporting of the experience using both qualitatively and quantitatively is expected to add value and scholarship to research in this area. In the area of online PBL few studies have reported on student collaboration toward a group based assignment, and few have incorporated peer based feedback and weighted assessment schemes. There are, therefore, several avenues of research to publish which will make a new contribution to the literature in this area.

### **3.7 Conclusion and reflections**

This project provided the opportunity to explore and implement ideas in the literature surrounding the support of student engagement in online learning. The practical realities of implementation have not previously been documented in a large scale project such as ours and although there were many challenges along the way, we feel that we have all learned more about the possibilities of student collaboration in an online space and the critical factors needed to help this to succeed. The following is a brief list of factors which may influence future learning designs in this area.

#### *Critical success factors*

- \* Staff willingness to engage with the project and try new technology and pedagogy;
- \* Regular OLM meetings;
- \* Use of microphones and headphones by all students;
- \* Staff engagement with training and development;

*Impediments:*

- \* Lack of staff and student time due to competing in course demands and time management skills;
- \* Short lead in time to prepare and orient to the design;
- \* Slow or unreliable internet connections for some students.

## Appendix A: Financial Report

### Budget

Budget item number	Budget item description	Basis of calculation	Total (\$)	Spent (\$)	Remaining (\$)
1	Software for RASCH analysis	Professional edition	1,320	1,320.00	
2	Teaching relief	3.5 hrs/week for 12 weeks x 2.5 academics across two semesters = 210 hours. 210hrs @ AX150 (\$41.05/hr for marking)	4,310.25	4,310.25	
3	2 x PBL staff workshops in Young	Venue = \$200 (x 2); Catering = \$300 (x2)	1,000.00	258.00	742.00
4	Transcription of student and staff interviews	5x 1hr staff interviews (@\$150 for a one hour interview); 4 x 1hr student focus groups (@\$200/1hr interview)	1,550.00	2,200.00	650.00
5	Project Officer	Level 7 Step 1, casual appointment, 8 hours/week for 43 weeks @52.87/hour + 16.5% onconst (total = \$61.59)	27,186.96	27,184.40	2.56
			35,367.21	35,272.65	94.56 (returned to u!mage)

### Actual Expenditure

Budget item number	Expenditure description	Basis of calculation	Amount (\$)	Date	Status
5	Project officer - Sarah Hyde	8 hours/week @61.59/h	6,344.40	15/05/2015	Confirmed
1	Software for RASCH analysis	Professional edition	1,320.00	10/08/2015	Confirmed
3	PBL staff workshops in Young - C Love	Rent of Orange RSL Room	258	Sep-15	Confirmed
5	Project Officer	8 hours/week for 40 weeks @61.59/hour	10,000.00	Nov-15	Confirmed
5	Project Officer	8 hours/week for 22 weeks @61.59/hour	10,840.00	Mar-16	Confirmed
2	Teaching relief	3.5 hrs/week for 12 weeks x 2.5 academics across two semesters = 210 hours. 210hrs @ AX150 (\$41.05/hr for marking)	4,310.25	Mar-16	Confirmed
4	Transcription of student and staff interviews	11 h at \$200 / 1 H interview	2,200	29/08/2016	Requested



## Appendix B: Table 1

### Evolution of the implementation of Online PBL in SAWS

Subject	When implemented	Cohorts	What we did	Assessment
AHT101 201530	Weeks 11-13	DE only N = 85	<p>PBL case on a farmer trying to improve crop yields. Case derived from farmer newsletter case study. Group task was to create a management plan. No specific information in the SO except for the reflective assessment task.</p> <p>Groups allocated based on learning style, degree and age; Orientation provided in an OLM.</p>	Reflective assessment task; 500 words; 10%
AGR202 201530	Weeks 4-6	DE with some internal students enrolled in DE cohort N = 83 (~20 internals)	<p>Immediately prior to res school. Orientation via an OLM. PBL case based on developing a Caring for Country plan. Case taken from local media.</p> <p>Info on hours per week for PBL included upfront in the SO and in the L&amp;T support strategies there was a detailed description</p> <p>Groups were mixed DE/Internal composition (unintentionally) based on geographic location.</p>	<p>Group project presentation assessed at Res School (15% Group mark)</p> <p>Self-evaluation of participation (10%)</p> <p>25% altogether</p>
AGB450 201630	Weeks 3-5	<p>All cohorts – DE, Internal, Muresk; N = 73</p> <p>Including Masters students</p>	<p>Orientation to PBL and Adobe provided on a recorded presentation associated with a mini-test</p> <p>Group task was to develop a Business Enterprise Report which required financial analysis of a spreadsheet associated with the case study. Case study based on a real case the subject coordinator had consulted on.</p>	<p>Group Business Enterprise Report (20% Group mark) weighted by peer evaluation</p> <p>Peer evaluation of participation (5%)</p> <p>Individual reflection assignment</p>

				(10%)
AHT101 201630	Weeks 5-7	DE only  N = 93	<p>Same case as 201530; detailed info in the subject outline</p> <p>Group composition based on postcode</p> <p>Orientation through recorded presentation and mini-test</p> <p>Students instructed to liaise with groups before starting the case using Groups tool in Interact.</p> <p>Group task to develop a consultant report for the Farmer in the case with key recommendations and rationale</p>	<p>Group Management Plan/Report (15%) weighted by peer evaluation</p> <p>Peer evaluation of participation (5%)</p> <p>Individual reflection (10%)</p>

N refers to active participant

Total = 334

## Appendix C: Screenshot of the Adobe connect online learning platform layout

Adobe connect was the primary platform used for students, within their PBL Groups to engage with the case and with each other about the case. Separate PBL rooms were established for each group with two layouts per Session/PBL Week and a number of pods in each layout to scaffold students' progress through the case. Please see Figure 2 as an example.

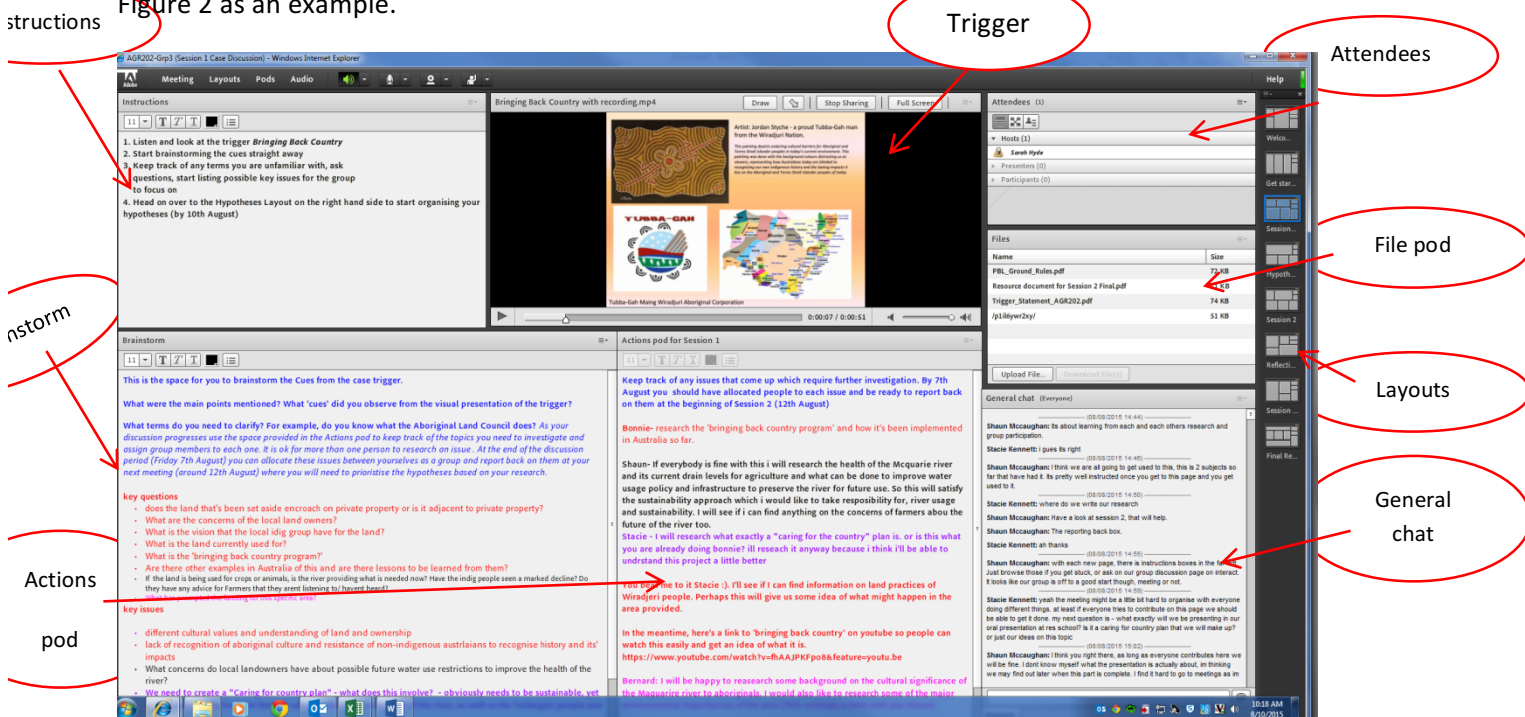


Figure 1: Example of a completed layout in Week 1 for one of the PBL groups

Students were asked to describe any problems they had in using the Adobe Connect online learning platform for PBL; 26 students from AHT101, 19 from AGR202, and 23 from AGB450 responded to this question. Although 17 students reported no problems or issues, 13 found it difficult that only one student at a time could take charge of the layout and that if one student changed layouts it changed for everyone. These were the two most commonly mentioned points. Other items mentioned by at least eight respondents included the complexity of having so many pods, and having a slow internet connection speed. Other comments were singular and related to microphones not working or being recognised, having limited character counts within the pods, and difficulty finding information when the Adobe Connect room, Wiki, and email were all being utilised to communicate information within groups.

## **Appendix D: List of resources available on the project Online PBL Interact site**

*Organised on the basis of planning, implementation, evaluation, and informative resources*

### Planning

- Subject delivery schedule which incorporates online PBL
- Subject outlines from subjects which utilised online PBL
- Student orientation material (text based and MP4 formats) and associated resources to support learning in group based online tasks
- Orientation to Adobe Connect PBL layouts (MP4)
- Introductory email to groups advising them about group composition

### Implementation

- PBL case audio visual triggers alongside case synopsis and accompanying tutor guides
- Weekly announcements posted during the implementation on each subject site reminding students about what to expect in the following week, what they needed to contribute
- Peer evaluation worksheets
- Student resources on giving and receiving feedback
- Tips for participating in online discussion
- Assessment rubrics for participation, reflective and subject specific tasks
- Weekly summary templates for students to record milestones

### Evaluation

- PDF of survey to evaluate student engagement in online learning
- Student and staff interview questions for the evaluation
- Ethics form and accompanying student and staff information statement and consent forms

### Informative resources

- Relevant journal articles
- PowerPoint presentations about the project presented at various CSU fora

## Appendix E: Descriptions of subject context

The *first implementation* occurred in a first year, first session course **AHT101: Professional Skills in Agriculture and Horticulture, DE mode**. This is a preparatory subject for all first year students enrolled across the nine undergraduate degree programs in the school. This subject was chosen as the first one to implement the online PBL trial because the residential school component had recently been removed and it was felt that students at this stage of the course would benefit from forming relationships with one another through collaborating on a group task. This course is not a coherent single discipline subject of study however, and several staff teach into the subject across a number of different modules. Finding the right place to introduce the task, and trying to lighten the student load for the three weeks required for students to engage in the task was not easy. As noted in the subject outline, the subject focuses specifically on professional skills in academic writing, professional behaviour, presentation skills, management skills, and social behaviours in agriculture. This is all embedded in the content on typical agricultural topics such as natural resources, weather, climate, Australian geography, animal industries, horticulture, pastures, crops and viticulture.

The *second implementation* occurred in a second year level subject, **AGR202: Food, Environment, and Culture, DE mode**, commonly undertaken by students enrolled in 8 degree programs. The main areas studied in the subject are ethics and ethical frameworks, environmental and social sustainability linked to economics, the major challenges facing agricultural production and food security, and how Indigenous Australian culture and values intersect with and can inform land use and management. This subject was suggested for the second implementation because of the broad nature of the content, the suitability of content to engage students in collaborative discussions, the benefits of small group work in facilitating student understanding of the subject, and also because it was the first time the subject had been taught by DE and the subject coordinator was keen to implement methods that would promote student interaction with one another as well as with the subject content.

The *third implementation* occurred in a fourth year level subject, completed by Masters as well as Undergraduate students<sup>13</sup>, **AGB450: Agricultural Business Risk and Investment**. The subject coordinator chose to implement the online PBL task across all cohorts, internal and DE. This subject was suggested as being suitable to implement the online PBL task as it was already using a case based methodology and the subject coordinator hoped to encourage more interaction between students, could see the benefits for students and staff of having groups work on the case studies together, and also hoped to improve the quality of student output on case analyses by having them collaborate together. The context for this subject was quite different to the other two for several reasons. Firstly, it was concentrated on one discipline area – understanding farm business performance Business risk, and students were expected to focus on the application and integration of assumed knowledge rather than developing new knowledge per se; secondly, the implementation occurred across multiple cohorts and sites and was also open as an elective subject to students outside of the school; and thirdly, it was one of the final year subjects for many students.

The *fourth implementation* occurred again in AHT101 with some changes based on staff experience and student feedback. In this final iteration, there was a new subject convenor, a major midsession exam had been removed, and a new subject coordinator was responsible at the beginning of the session, replaced half way through by the original subject coordinator from the first implementation who had returned from a period of unexpected leave.

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<sup>13</sup> AGB450 is a core subject for MABM students and an elective for other Masters students; at the undergraduate level, AGB450 is undertaken by students in five different degree programs, and it is a core subject for BABM and WineBus students

## Appendix F:

Table 2

Stages and key activities involved in Online PBL implementation

Stage	Timing	Key activities	Outcome
1	Nov 2014-Feb2015	Literature review and completion of grant application and study design; subjects for implementation chosen	Achieved
2	Feb-March2015	Obtain ethics approval to conduct an evaluation of the project	Granted
3	Dec 2014-March 2015	PBL case design for AHT101 – including tutor guide and AV trigger	3 cases created
4	Feb-March2015	Adobe Connect rooms established; Group composition arranged; Development and implementation of staff and student orientation to online PBL	12 groups of 8-10 students created; 12 PBL rooms established; Presentation on facilitation skills to staff conducted; Students oriented to PBL in an OLM
5	March-June 2015	Facilitation of online PBL in AHT101 using one case over a 3 week period + an individual reflection task and rubric  Student survey and staff and student interviews conducted to evaluate the implementation	Survey Monkey survey designed and used  Assessment rubric developed
6	June-July2015	Design of PBL case, trigger and tutor guide for AGR202; creation of 15 groups of 6-8 students put together on basis of geographic location; design of 15 PBL meeting rooms adjusted on the basis of feedback AHT101	Case and case resources developed  Group based assessment task developed with rubric
7	July-August 2015	Facilitation of online PBL and group assessment task at the AGR202 residential school; rubric for self-evaluation of participation also developed	Assessment of group presentation  Facilitation of group preparation for assessment task at residential school

8	September-Oct 2015	Evaluation of AGR202 implementation with student survey and staff and student interviews	Survey Monkey survey designed and used  Results written up in a team project report
9	Oct-Nov 2015	Project team meeting/staff workshop to review results from the first two implementations and decide on approach for next two implementations; Discussion of presentation for CSUEd	Preliminary report written  CSUEd Presentation developed  Staff development for AGB450
10	Dec 2015-Feb 2016	Literature review on Community of Inquiry to inform research write up  Design of case and supporting material (tutor guide and trigger) for AGB450; Set up of 13 PBL meeting rooms in Adobe Connect modified based on student feedback  Design of group based assessment task and rubric  Revised and shortened student orientation to both PBL and Adobe Connect made available as a recorded presentation with an associated mini-test	Case resources and trigger developed  Student resources to support PBL developed and put on a separate part of subject site  Draft write up begun
11	Feb-March 2016	Decisions and discussions about stage of implementation of online PBL in AHT101 based on evaluation results and staff feedback  Group composition based on geographic location – set up of 22 groups of 4-6 students + 22 PBL meeting rooms  Design of group based assessment task and rubric	Student orientation to PBL via recorded presentations and mini-quiz + OLM  Revised assessment task (compared with 2015 implementation)
12	March-April 2016	Facilitation of online PBL in AGB450  Survey results from AHT101 and AGR202 analysed with Rasch and Factor analysis	Case completed  Revised survey completed/designed for implementation

13	May 2016	Staff and student evaluation of online PBL in AGR202  Facilitation of online PBL in AHT101	Survey monkey design completed using the revised survey and results analysed by Factors
14	June 2016	Evaluation of online PBL in AHT101 and analysis of results  Analysis of whole of project results and write up of final report	Report completed



## AHT101 Online Small Group experience 2016

### 1. Welcome

**Thank you for the opportunity to collect some feedback about your online small group experience in AHT101. All responses are anonymous and your participation is voluntary. The information you provide will be used for research purposes and to improve the course :-)**

**First, we'd like to know a little bit about you....**

1. What is your gender?

☐

Male

Female

2. Please select your age range

☐

20-25

☐

26-30

☐

31-36

☐

36-40

☐

41-45

☐

45-50

Over 50

3. Where are you currently living?

☐

Australian capital city

☐

Australian metropolitan city (E.g. Newcastle, Wollongong)

☐

Large Australian town (e.g. Armidale, Orange, Wagga)

☐

Small Australian town (e.g. Parkes)

☐

Remote area

Outside of Australia

Other (please specify)

---

4. How many hours per week on average do you work in paid employment?

☐ I am not currently in paid employment

☐ <15

☐ 16-25

☐ 26-35

☐ 36-40

☐ >40

5. If you are not currently in paid employment, please describe your situation (e.g. retired, primary carer, full time student)

## 2. Study and IT situation

**Now we'd like to gain an understanding of your study pattern and access to technology....**

6. How many subjects did you study in Session 1 this year?

☐ 1

☐ 2

☐ 3

☐ 4

7. What was your overall mode of enrolment for 201630?

☐ Internal

☐ DE

8. What other subject (s) did you also study alongside AGB450?

9. What degree are you enrolled in?

☐ Bachelor of Agribusiness Management

☐ Bachelor of Ecological Agriculture

☐ Bachelor of Horticulture

☐ Bachelor of Viticulture and Wine Sciences

☐ Bachelor of Wine Science

☐ Bachelor of Viticulture

☐ Bachelor of Wine Business

☐ Bachelor of Agriculture

Other (please specify)

10. How regularly do you access the internet for your studies?

- ☐ Daily
- ☐ Several times per week
- ☐ About once a week
- ☐ Less than once a week

11. How do you currently access the internet for your studies?

- ☐ At home using dial up
- ☐ At home using broadband or another high speed connection
- ☐ At work using dial up
- ☐ At work using a high speed connection
- ☐ Through an internet cafe
- ☐ In hotels using broadband

Other (please specify)

12. Please select all devices on which you access Adobe Connect for the duration of the PBL case

- ☐ Laptop
- ☐ PC
- ☐ Mac
- ☐ a mobile device

Other (please specify)

13. If you access the Adobe Connect pages using a mobile device, please comment on the experience, how well it worked (or didn't) and which device you used

14. Please describe any problems you met with in using the online learning platform for PBL (Adobe Connect)

15. What suggestions do you have for improving the online learning system for the purposes of PBL?

16. What other modes of communication did your group use? Select all that apply

- ☐ Personal email
- ☐ Phone
- ☐ Asynchronously through the subject Interact site (i.e. chat pods)
- ☐ Facebook
- ☐ Synchronously using microphones
- ☐ Synchronously (i.e. all on at the same time) using the chat pods
- ☐ Other

Other (please specify)

3. More nosy questions ;-)

17. Have you studied at university before?

☐ Yes

☐ No

18. Please specify what you have previously studied and if you completed it or not

19. Which group number were you in?

☐ 1

☐ 2

☐ 3

☐ 4

☐ 5

☐ 6

☐ 7

☐ 8

☐ 9

☐ 10

☐ 11

☐ 12

☐ 13

☐ 14

☐ 15

☐ 16

☐ 17

☐ 18

☐ 19

☐ 20

☐ 21

☐ 22

20. If you did participate in the PBL exercise, please respond to the next series of questions.

If you did not participate in the PBL exercise, please specify why (e.g. lack of time, uncertain what was required, sick, problems with the technology etc)

4. PBL Questions :-)

**The next series of questions will ask you about your agreement with various statements about the PBL case and the group learning experience**

21. On average, how many synchronous discussions did you have with your PBL group each week?

- ☐ One
- ☐ 2-3
- ☐ 3-4
- ☐ 4-5
- ☐ More than 5

Other (please specify)

22. On average, how often did you log into the site to have a look and/or contribute

- ☐ More than once a day
- ☐ At least once a day
- ☐ At least once every two days
- ☐ 2-3 times per week
- ☐ Once a week



23. Please rate your agreement with the following items about the PBL case

	Strongly disagree	Disagree	Unsure	Agree	Strongly agree
I found the PBL case appropriately challenging	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt adequately prepared for the PBL task	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I consulted the orientation material (i.e. lecture and slides from Sarah, PDFs posted on the PBL part of the Interact site) prior to beginning the PBL task	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The PBL case enabled me to build on <input type="radio"/> knowledge I already had	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
I developed new knowledge by working on the PBL case	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Working on the case helped me to examine my own viewpoints on the topic	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I learned something in this case that has changed the way I understand an issue or concept	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was able to connect ideas from this case to my prior knowledge and/or experience	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I learned a method of approaching new problems through my participation in the PBL task	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

24. The best features of this online PBL task and/or case were:

---

25. The online PBL task could be improved by:

26. Please provide any specific comments about the case here

## 5. Group learning

27. Please rate your agreement with the following items

	Strongly disagree	Disagree	Unsure	Agree	Strongly agree
I developed a social bond with other members of my PBL group	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt comfortable asking another student for help to understand the task content	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt comfortable making suggestions about the case to my group	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The weekly Online Meeting was a valuable support throughout the PBL task	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt comfortable asking questions about course content in my group	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I explained course or case material to one or more students in my group	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I had to consider several different points of view from group members during group discussions of the case	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
As a student on a Distance Education programme, participation in the PBL task provided me with a useful additional support network	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Having participated in the PBL task, I feel more confident of my abilities to work online in small groups	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Strongly disagree	Disagree	Unsure	Agree	Strongly agree
I felt that I developed a deep understanding of the subject content	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	
Our group developed a good strategy for completing the task	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was satisfied with the final product we developed (i.e. the group report)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## 6. More group learning questions....

28. Please rate your agreement with the following items

	Strongly disagree	Disagree	Unsure	Agree	Strongly agree
The tutorial program (OLM & PBL task) had a positive impact on my understanding of Agriculture topics	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was keen to log on to read messages left by other members of my PBL group	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I learned a lot from other students in my group while working on the PBL task	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was satisfied with the amount of discussion in my group	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was satisfied with the quality of discussion in my group	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I found the access to different students' ideas valuable for my learning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The tutor(s) provided appropriate guidance when needed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I found the moral support of my PBL group beneficial for my learning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt in control of my own learning during the PBL weeks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am still in contact with others in my group	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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29. What would have helped your group to work better?

## 7. Your participation in PBL

30. Please rate your agreement with the following items

	Strongly disagree	Disagree	Unsure	Agree	Strongly agree
Throughout the PBL weeks I discussed my ideas with other students (verbally and/or online)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I shared information with other students each week throughout the PBL task	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have developed new ways of thinking as a result of my participation in the PBL group	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel I have developed new friendships with others in the group as a result of my participation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I enjoyed working in a PBL group	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

8. Considering the future

**You're on the home stretch now :-)**

31. I think student engagement with each other could be improved in other subjects with the inclusion of online PBL

Strongly disagree

☐

Disagree

☐

Unsure

☐

Agree

☐

Strongly agree

☐

Other (please specify)

32. What advice would you give to future AHT101 students doing online PBL?



9. THANK YOU!!

**Thank you for giving your time so generously to assist us with the implementation and evaluation of online PBL in the School of Agriculture and Wine Sciences. We really appreciate and value your contributions :-)**

**Contact Sarah shyde@csu.edu.au if you have any questions**

Table 3: Survey items represented in each Factor<sup>14</sup>

<b>Factor 1 (36%): Outcomes of cognitive engagement (in PBL and Group Learning)</b> <i>Task based outcomes</i>
7. I was able to <u>connect ideas</u> from this case to my prior knowledge/experience
2. The PBL case enabled me to <u>build on knowledge</u> I already had
8. I learnt a method of <u>approaching new problems</u> through my participation in the PBL task
5. Working on the case helped me to <u>examine my own viewpoints</u> on the topic
3. I <u>developed new knowledge</u> by working on the PBL case
6. I learnt something in this case that <u>changed the way I understand</u> an issue or concept
29. The tutorial program (OLM & PBL task) had a <u>positive impact on my understanding</u> of Agriculture topics
23. Having participated in the PBL task, I <u>feel more confident</u> of my abilities to work online in small groups
45. I have developed <u>new ways of thinking</u> as a result of my participation in the PBL group
47. I <u>enjoyed</u> working in a PBL group
<b>Factor 2 (43%): Success factors facilitating learning? Factors positively mediating engagement?</b>
38. The tutor (s) provided appropriate <u>guidance</u> when needed
1. I found the PBL case <u>appropriately challenging</u>
40. I felt in <u>control</u> of my own learning during the PBL weeks
18. The <u>weekly OLM</u> was a valuable <u>support</u> throughout the PBL task
24. I felt that I developed a <u>deep understanding</u> of the subject content
30. I was keen to log on and read <u>messages left by other members</u> of my PBL group
<b>Factor 3 (49%): Participation? Metacognitive behaviours/engagement</b>
19. I felt comfortable <u>asking questions</u> about course content in my group
20. I <u>explained</u> course or case material to one or more students in my group
16. I felt comfortable <u>making suggestions</u> about the case to my group
14. I felt comfortable <u>asking another student for help</u> to understand the task content
42. Throughout the PBL weeks I <u>discussed my ideas</u> with other students
22. As a student on a DE program, participation in the PBL task provided me with a useful <u>additional support network</u>
<b>Factor 4 (53%): Collaborative learning outcomes/opportunities</b>
33. I was satisfied with the <u>amount of discussion</u> in my group
34. I was satisfied with the <u>quality of discussion</u> in my group
25. Our <u>group</u> developed a good <u>strategy</u> for completing the task
35. I found the <u>access to different students ideas</u> valuable for my learning
39. I found the <u>moral support</u> of my <u>PBL group</u> beneficial for my learning
31. I <u>learned</u> a lot from <u>other students</u> in my group while working on the PBL task
26. I was satisfied with the <u>final product</u> <u>we</u> developed (i.e. the management plan)
<b>Factor 5 (57%): Social outcomes/benefits</b>
46. I feel I have developed <u>new friendships</u> with others in the group as a result of my participation
41. I am <u>still in contact</u> with others in my group
12. I developed a <u>social bond</u> with other members of my PBL group
<b>Factor 6 (61%): Overlaps with participation – component 3</b> <i>Essentially ways of collaboration but involving less metacognition</i>
21. I had to consider several different points of view from group members during group discussions of the case
43. I shared information with other students each week throughout the PBL task
42. Throughout the PBL weeks I discussed my ideas with other students

<sup>14</sup> Items are presented in order of loadings for each factor, i.e. items which loaded more strongly on a factor are listed first

## Appendix H: Rasch analysis of survey results

Table 4 Statistical significance of the 5 factors for each trait. “\*” indicates a significant difference of the means at the 0.1 level and “\*\*\*” indicates a significant difference of the mean at the 0.05 level. Within a trait and a Factor, similar letters indicate which factor level pairs display a significant difference of the mean.

			F1 – Outcomes of Cognitive Engagement	F2 – Success Factors	F3 – Participation/ Metacognitive Behaviours	F4 – Collaborative Learning Outcomes	F5 – Social Outcomes and Benefits
Factor	Factor Levels	n	Mean	Mean	Mean	Mean	Mean
No Division	(N/A)	149	0.9	0.7	1.8	0.8	-0.5
Subject	AHT101v1	49	0.9	0.7	1.3*a	0.8	-1.7**abc
	AGR202	25	0.8	0.6	1.9	0.6	-0.2**a
	AGB450	30	0.6	0**a	1.8	0.8	-0.1**b
	AHT101v2	45	1.2	1.1**a	2.4*a	0.8	0.3**c
Gender	Male	79	1.1	0.9*	1.8	0.9	-.8*
	Female	67	0.7	0.4*	2.0	0.7	-0.1*
Commitment	JRLess20	48	1.1	0.7	2.1	1.0	-0.2
	JRMore20	23	0.6	0.5	1.9	0.6	-0.3
	OC	72	0.9	0.8	1.7	0.9	-0.8
	Borderline	5	0.2	-0.4	1.4	-1.3	-0.6
Degree	BABM	45	1.1	0.6	2.0	1.0	-0.3
	BEAS	9	1.2	0.5	2.7	1.2	-0.2
	Hort	19	0.8	0.8	2.3	0.9	-0.7
	VitWine	4	2.5	1.8	1.6	1.0	0.2
	Wine	27	0.4	0.7	1.5	0.6	-0.8
	Vit	6	0.8	0.8	1.3	0	0.5
	MABM	5	0.4	1.1	3.3	1.7	2.1
	AG	24	0.7	0.4	1.6	0.7	-1.1
	WB	3	1.1	0.5	0.9	0.2	-1.4
	AnSc	1	1.7	1.4	2.2	1.7	2.1
	MAnSc	1	-1.3	-0.9	-0.6	-0.4	-2.1
	MSA	4	1.6	1.0	1.1	0.5	-1.3
NbDisc	1	69	0.7	0.4**a	1.6	0.4*a	-1**a
	2to3	64	1.2	1.1**a	2.2	1.3*a	0**ab
	3to4	7	0.5	-0.1	1.5	0.6*	-1.9**b
	More4	3	0.9	0	1.3	0.6*	1.1

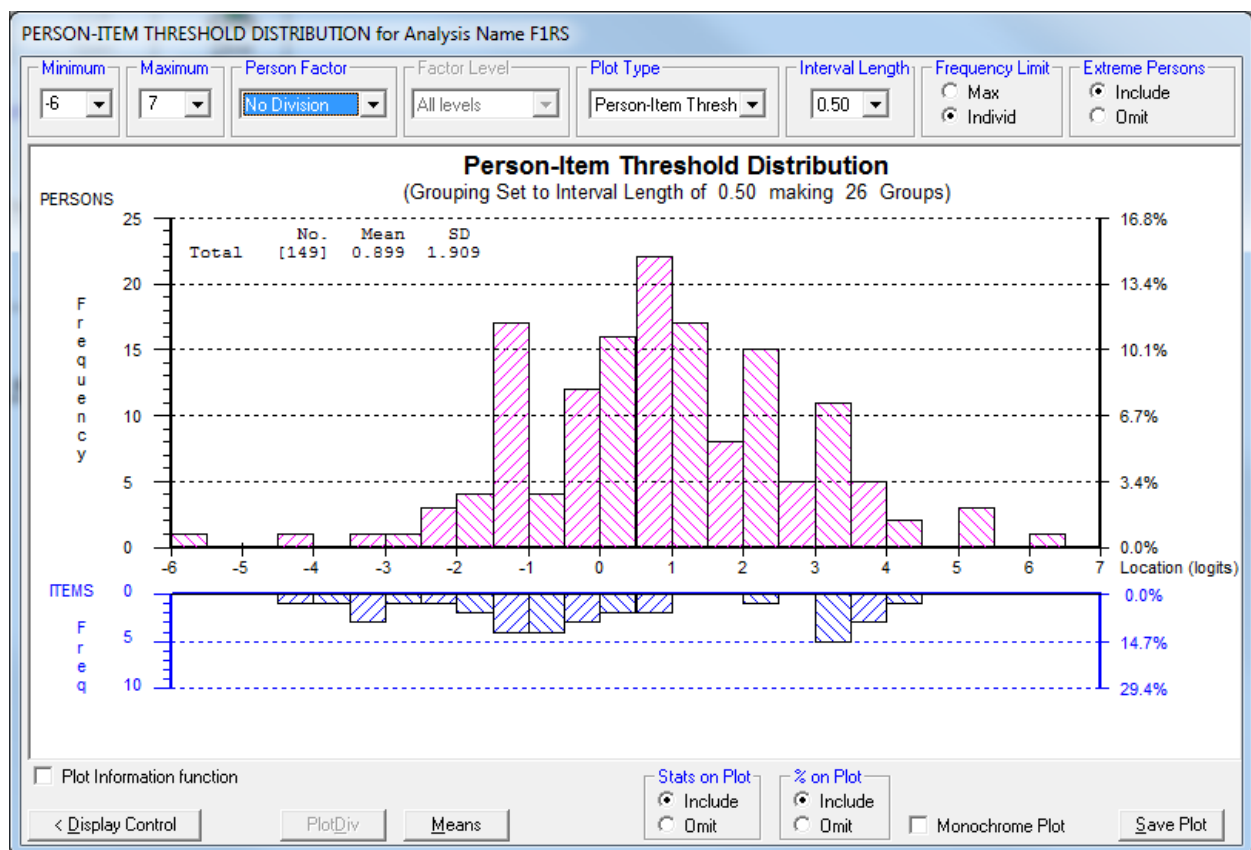


Figure 1: Factor 1 distribution (Outcomes of cognitive engagement)

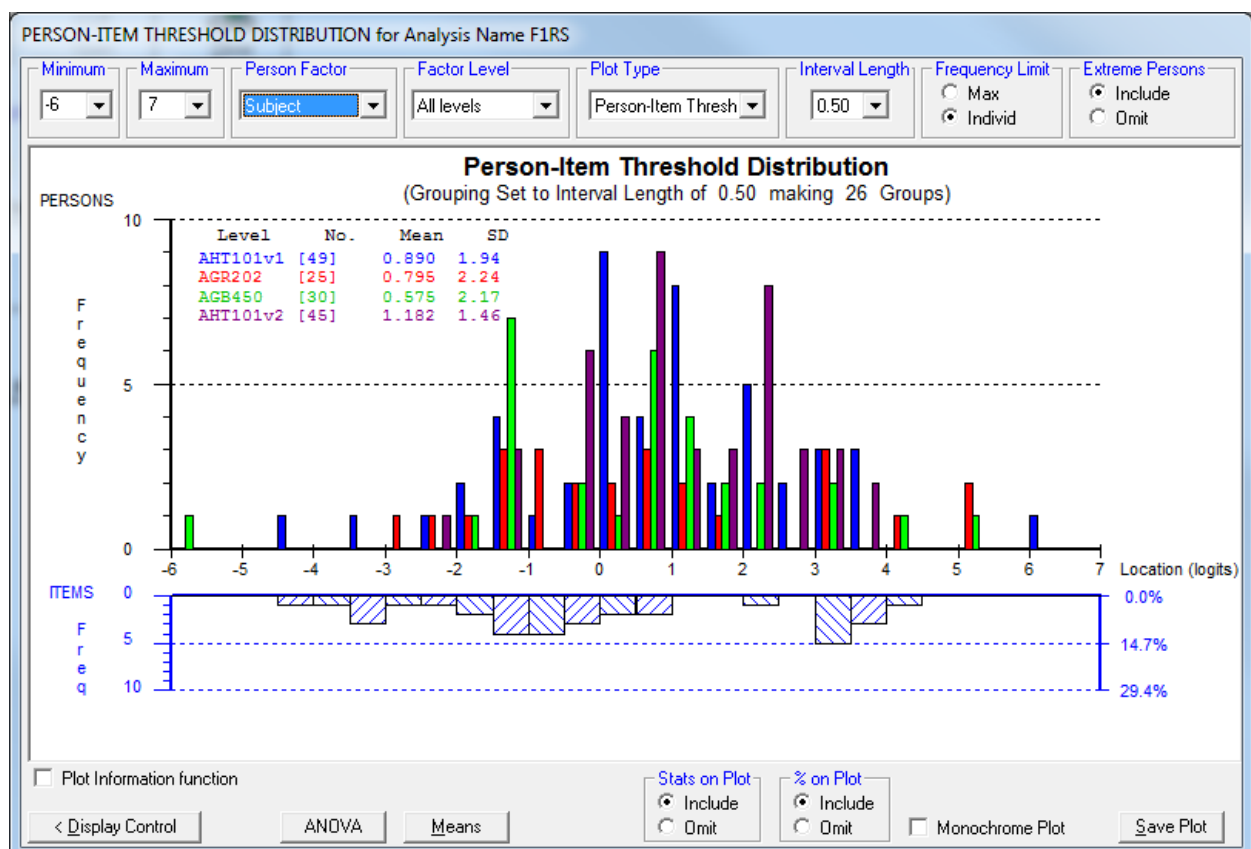


Figure 2: Distribution of Factor 1 responses by subject

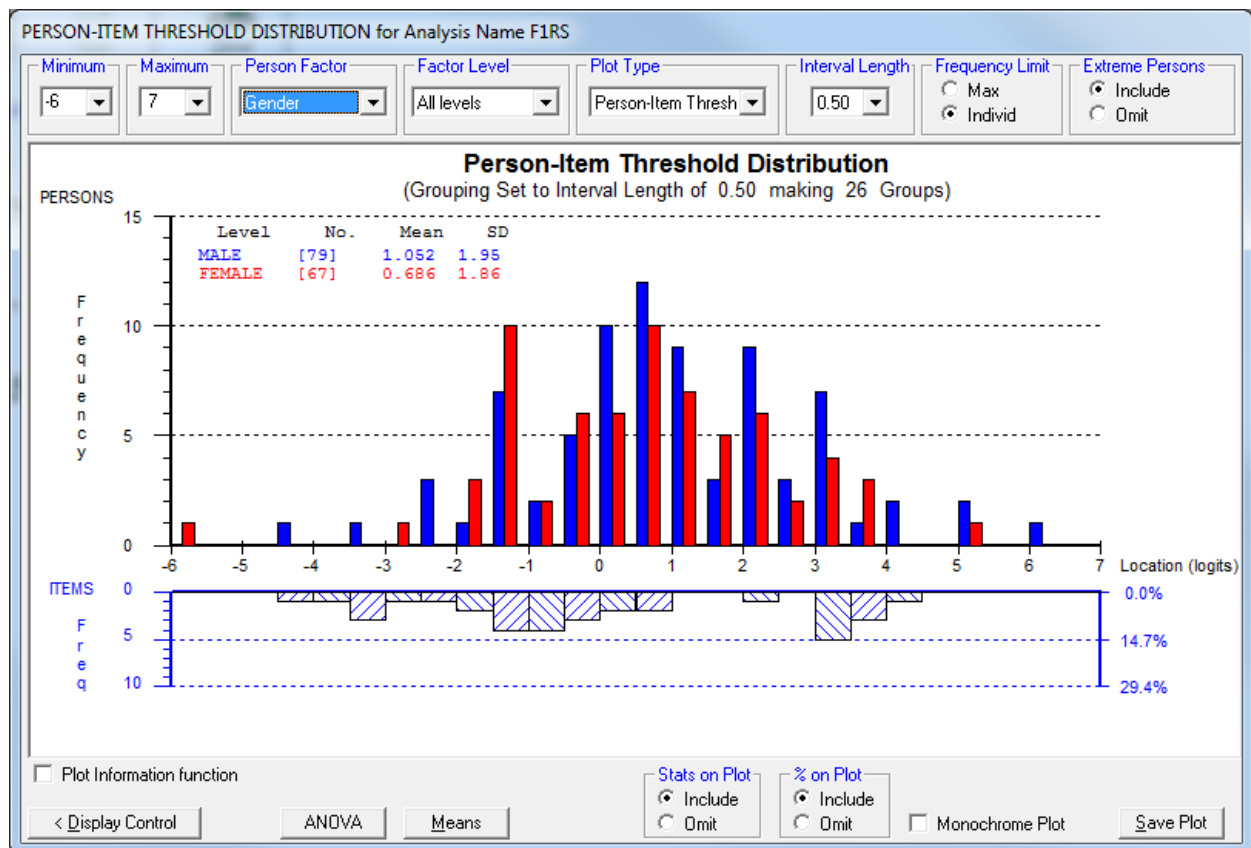


Figure 3: Factor 1 distribution by gender

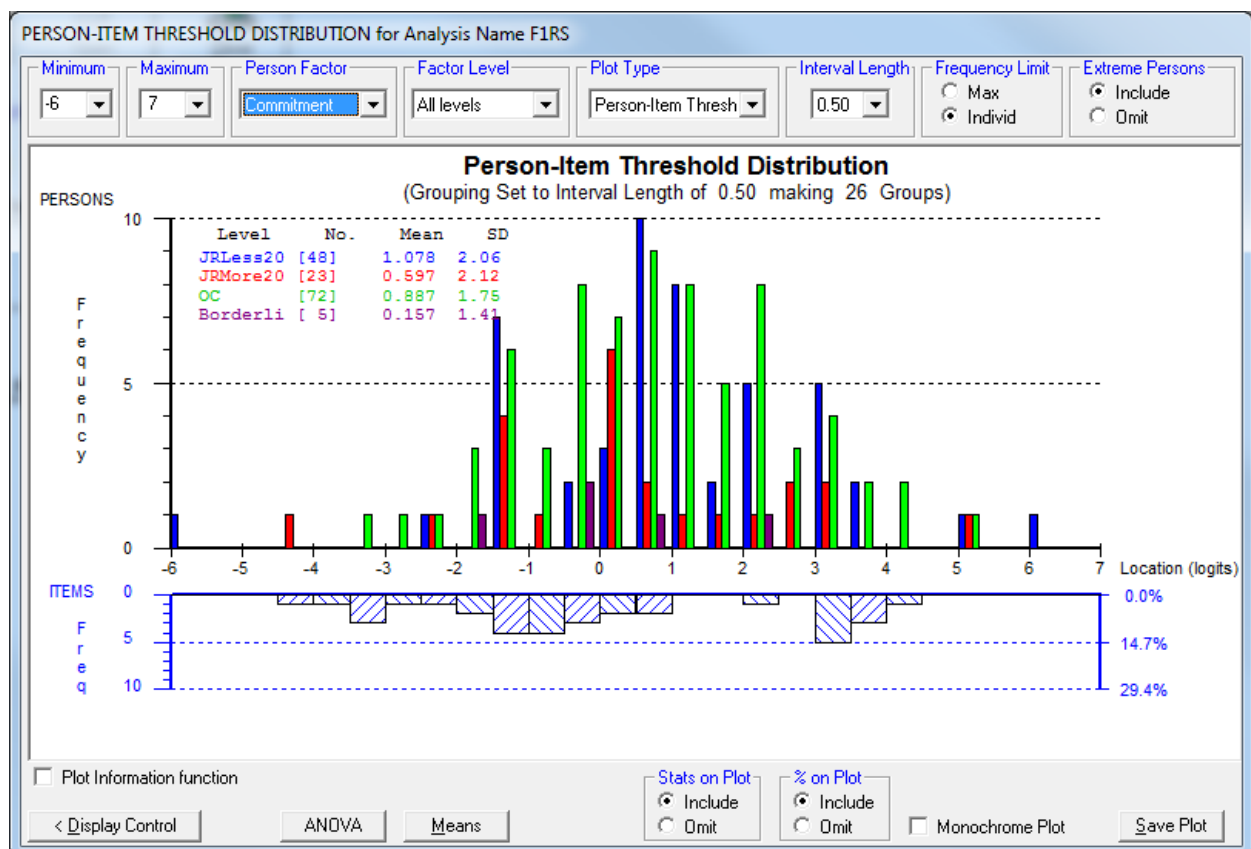


Figure 4: Factor 1 distribution by level of commitment

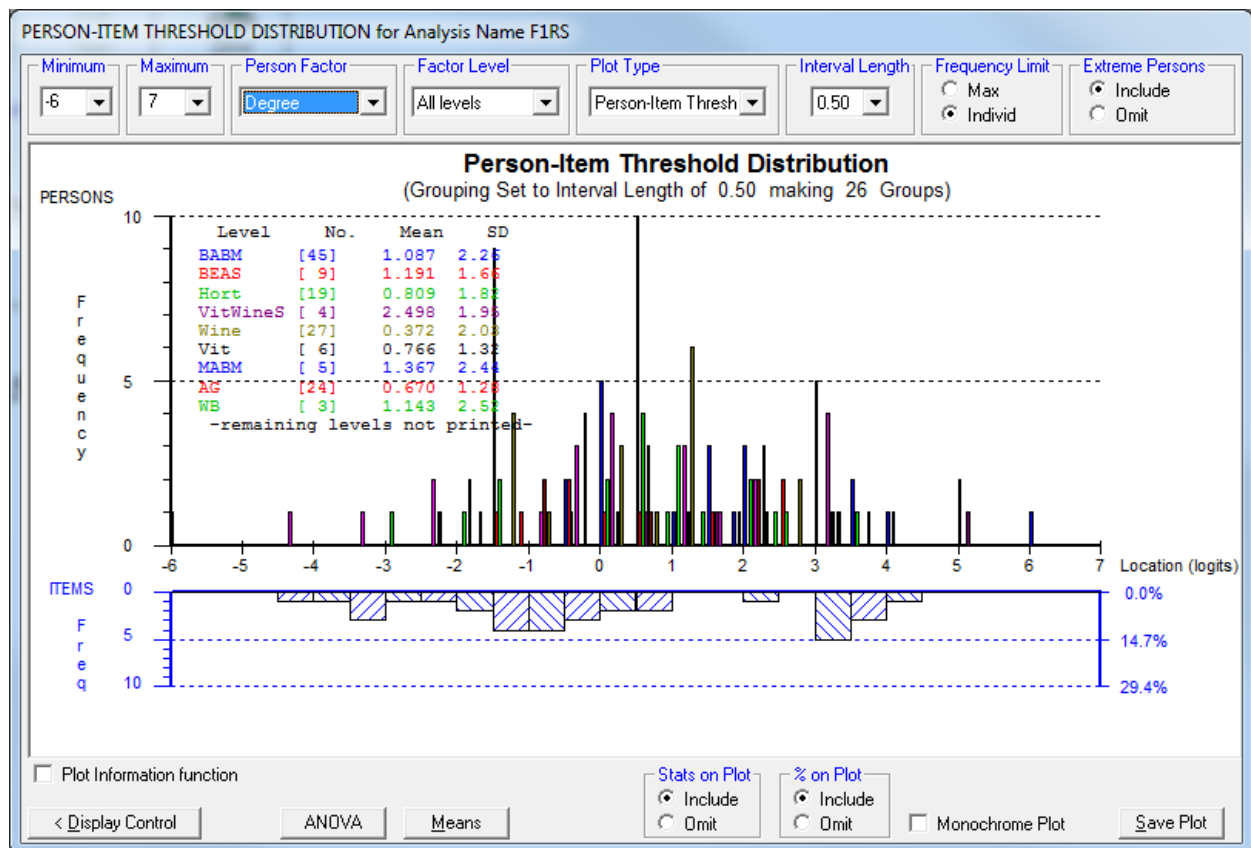


Figure 5: Factor 1 distribution by course enrolled

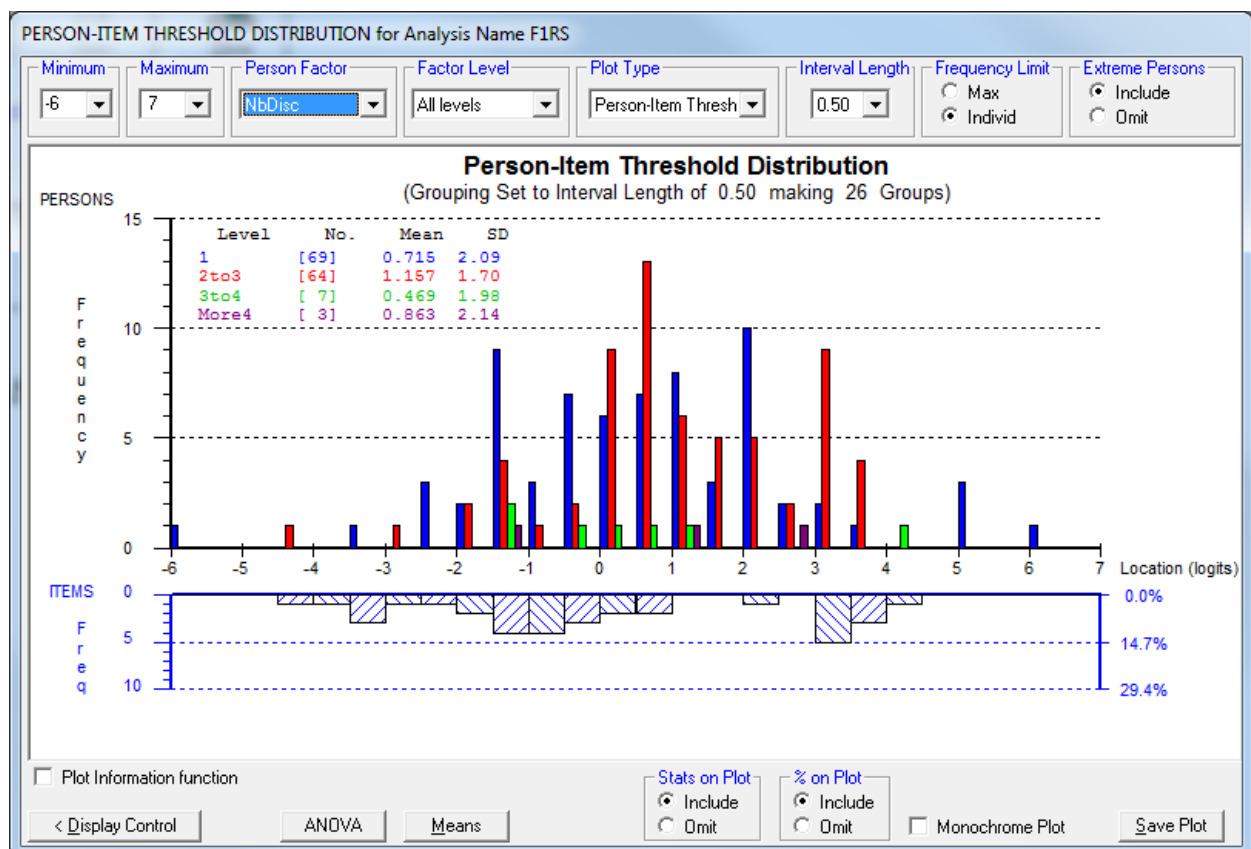


Figure 6: Factor 1 distribution by number of synchronous discussions per week

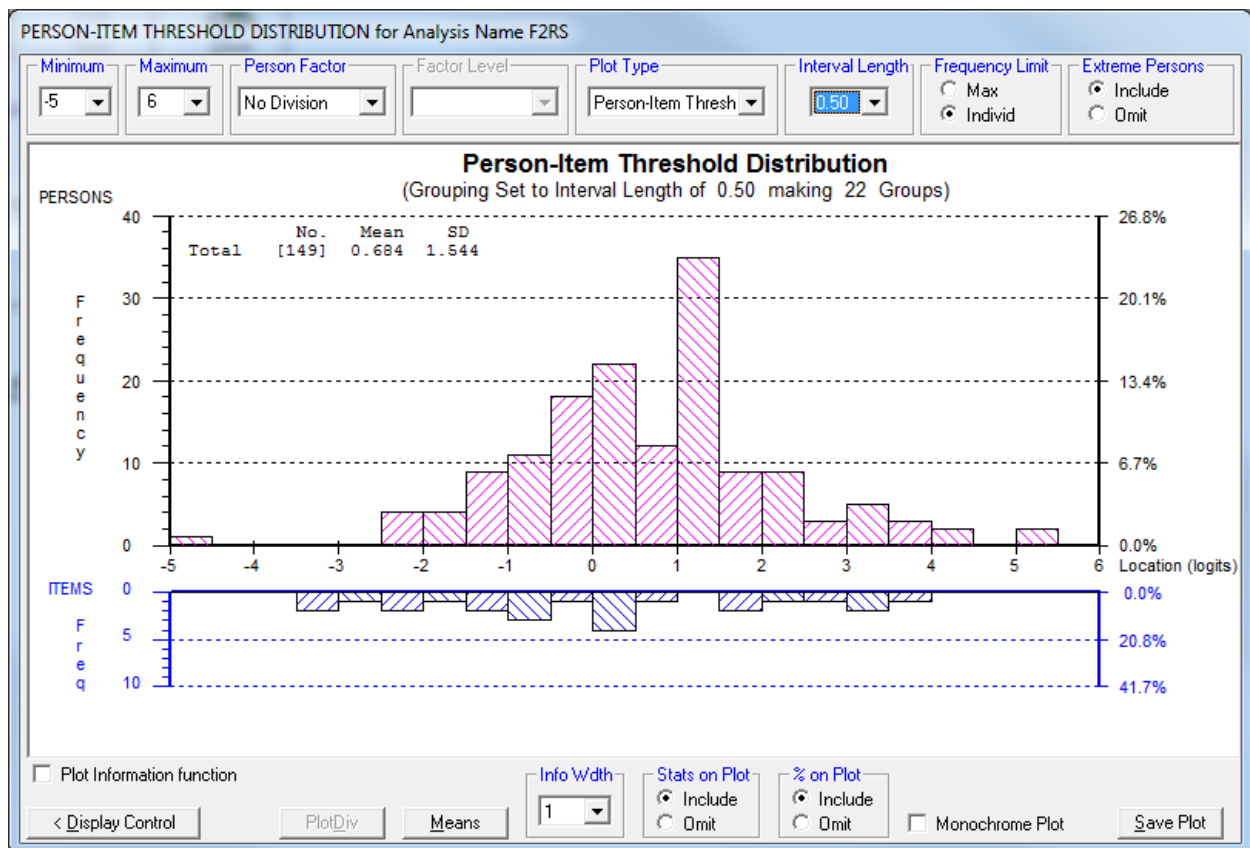


Figure 7: Distribution of responses for Factor 2

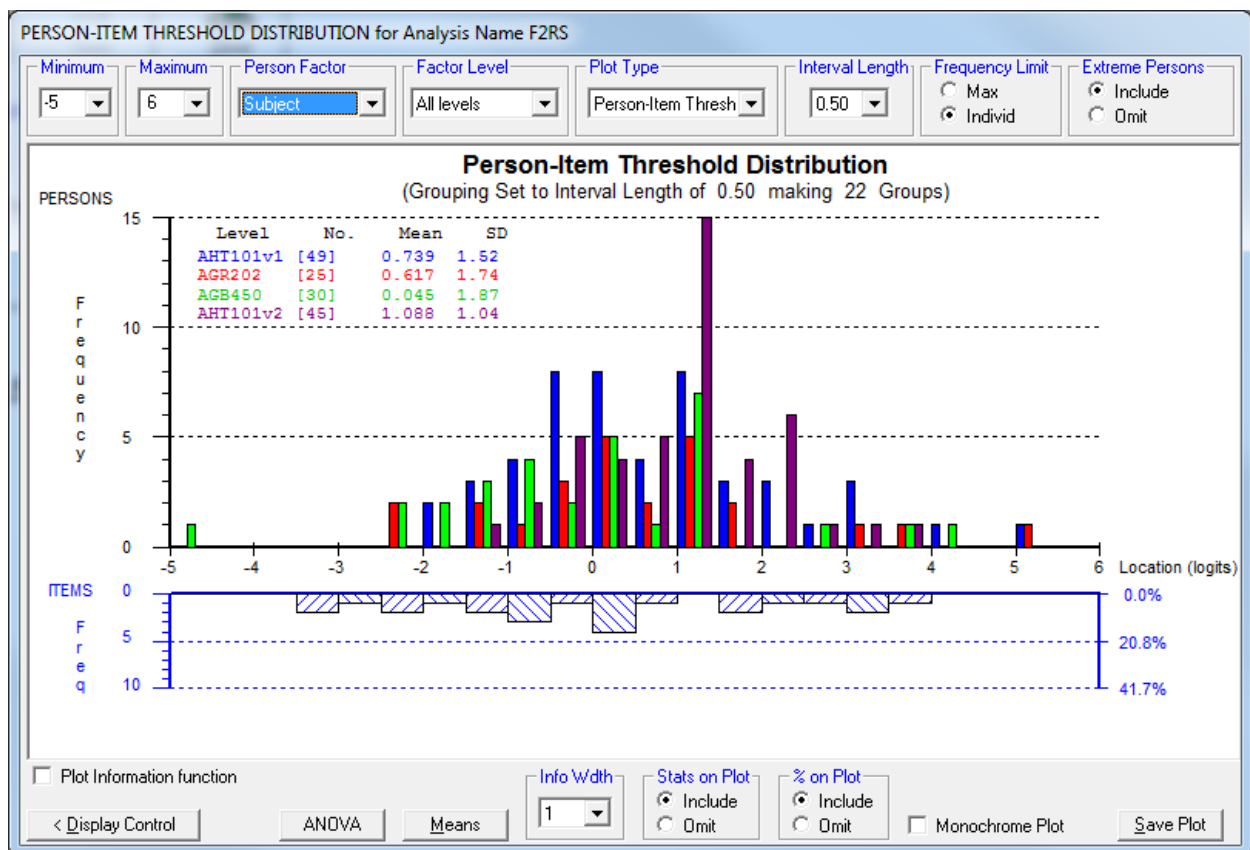


Figure 8: Distribution of responses for Factor 2 by subject

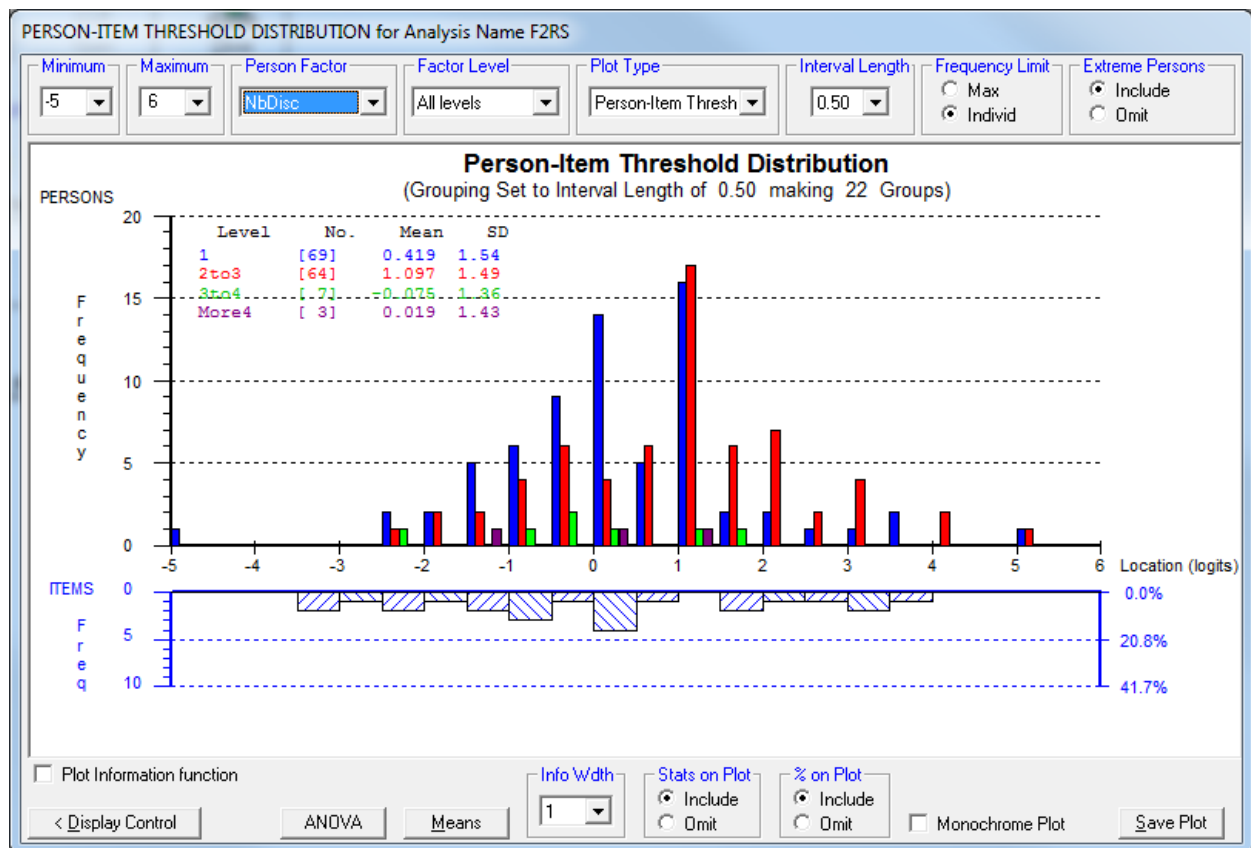


Figure 9: Distribution of responses for Factor 2 by number of synchronous discussions per week

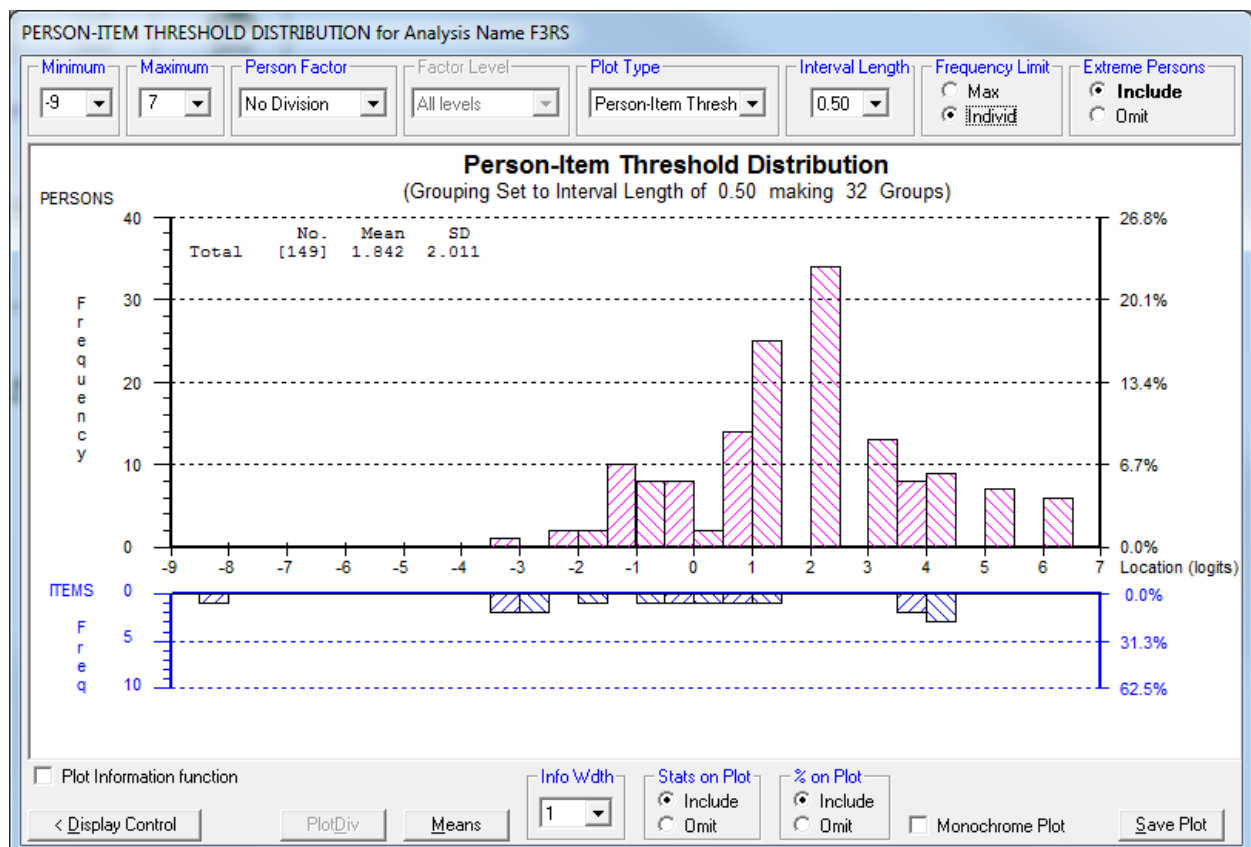


Figure 10: Distribution of responses for Factor 3



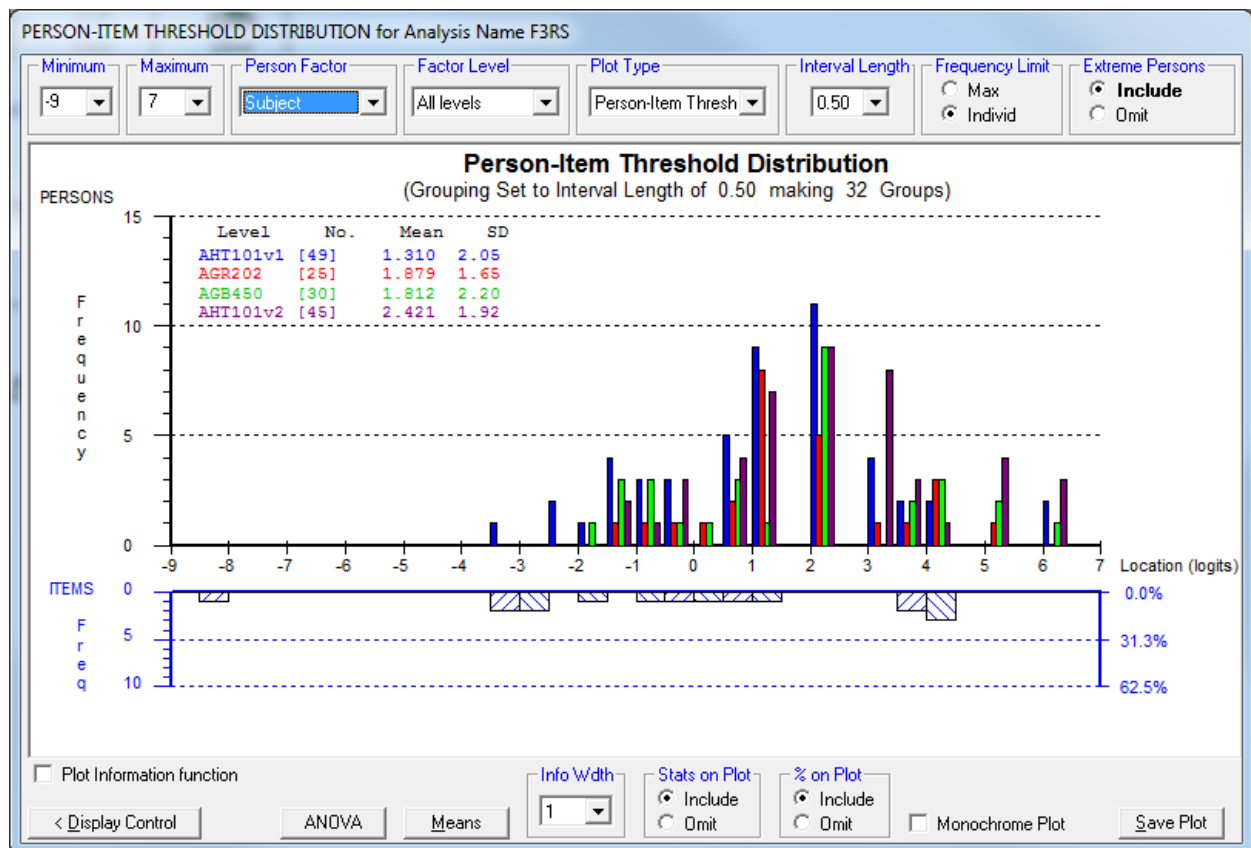


Figure 11: Distribution of responses for Factor 3 by subject

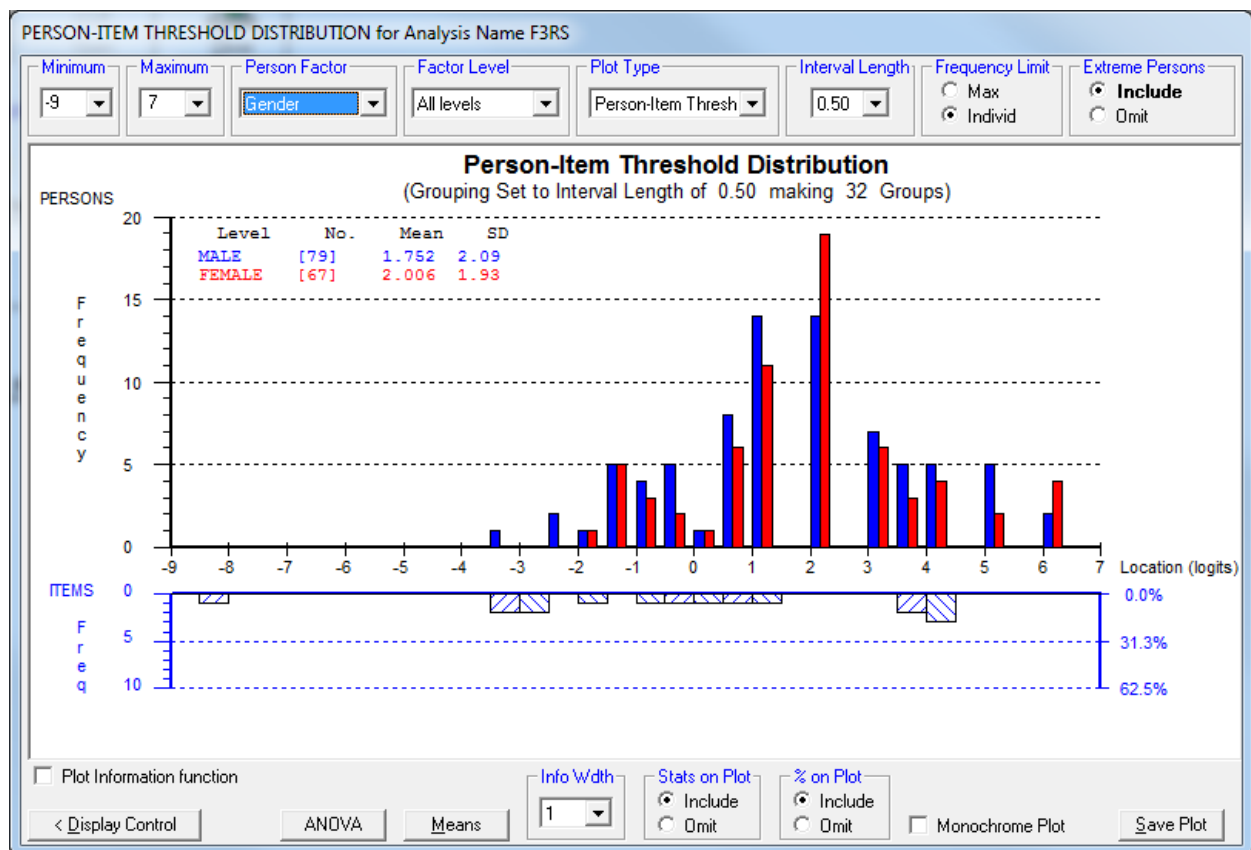


Figure 12: Factor 3 distribution of responses by gender

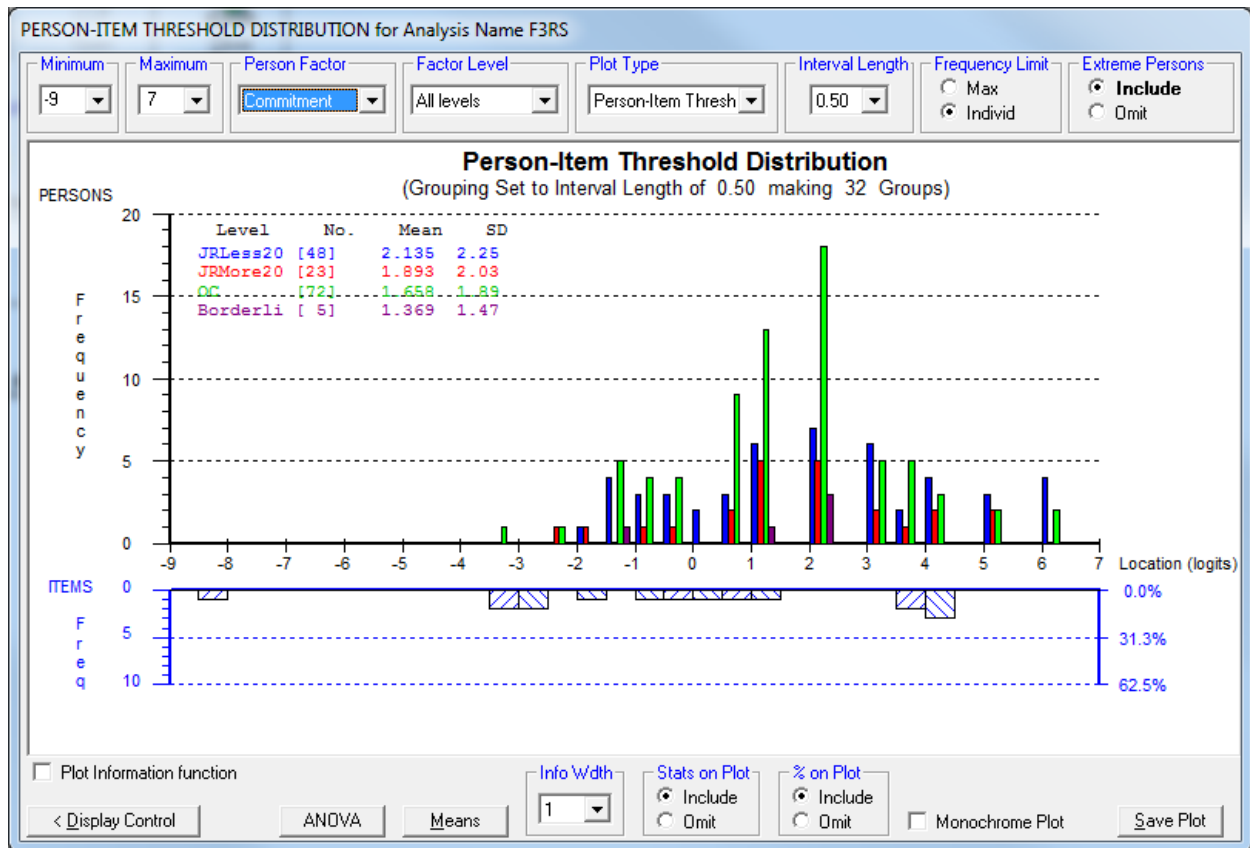


Figure 13: Distribution of Factor 3 responses by level of commitment

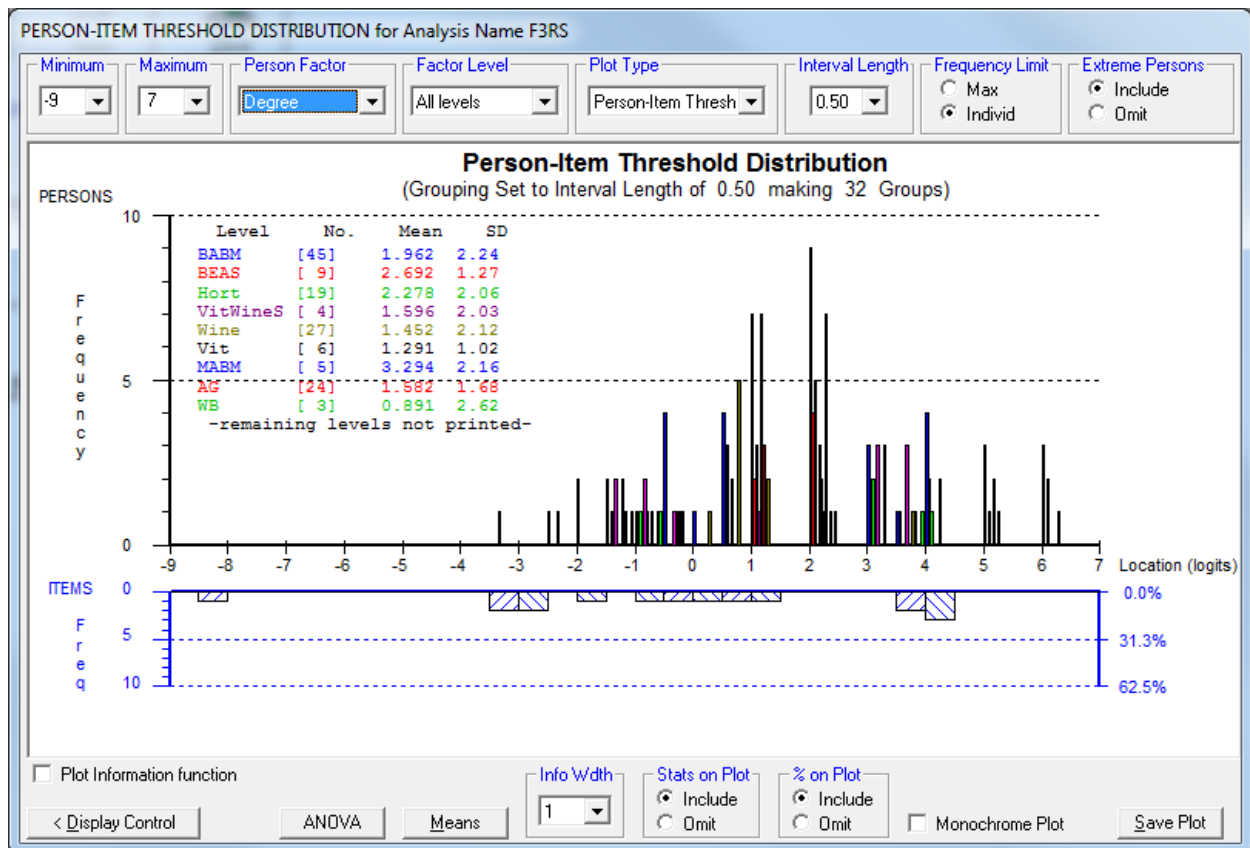


Figure 14: Distribution of responses for Factor 3 by course enrolled

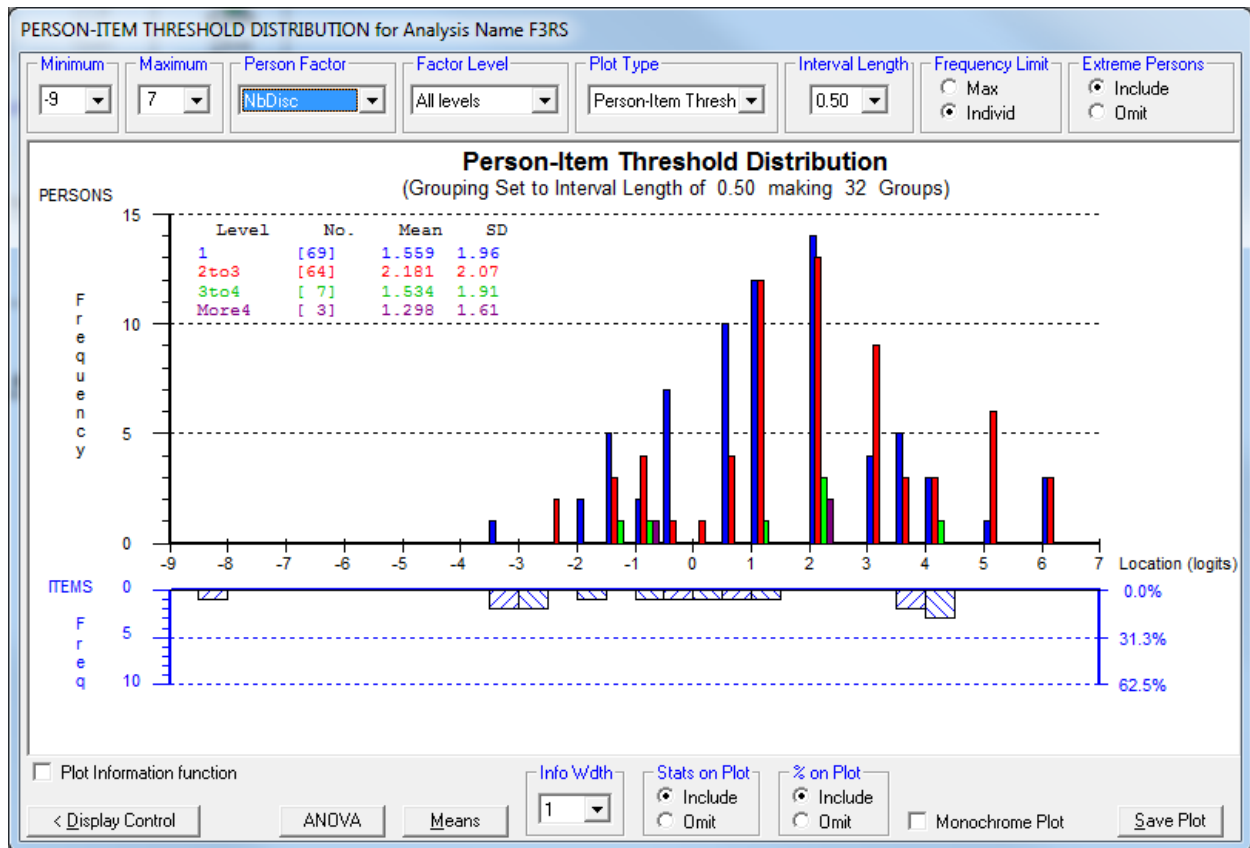


Figure 15: Distribution of responses for Factor 3 by number of weekly synchronous discussions

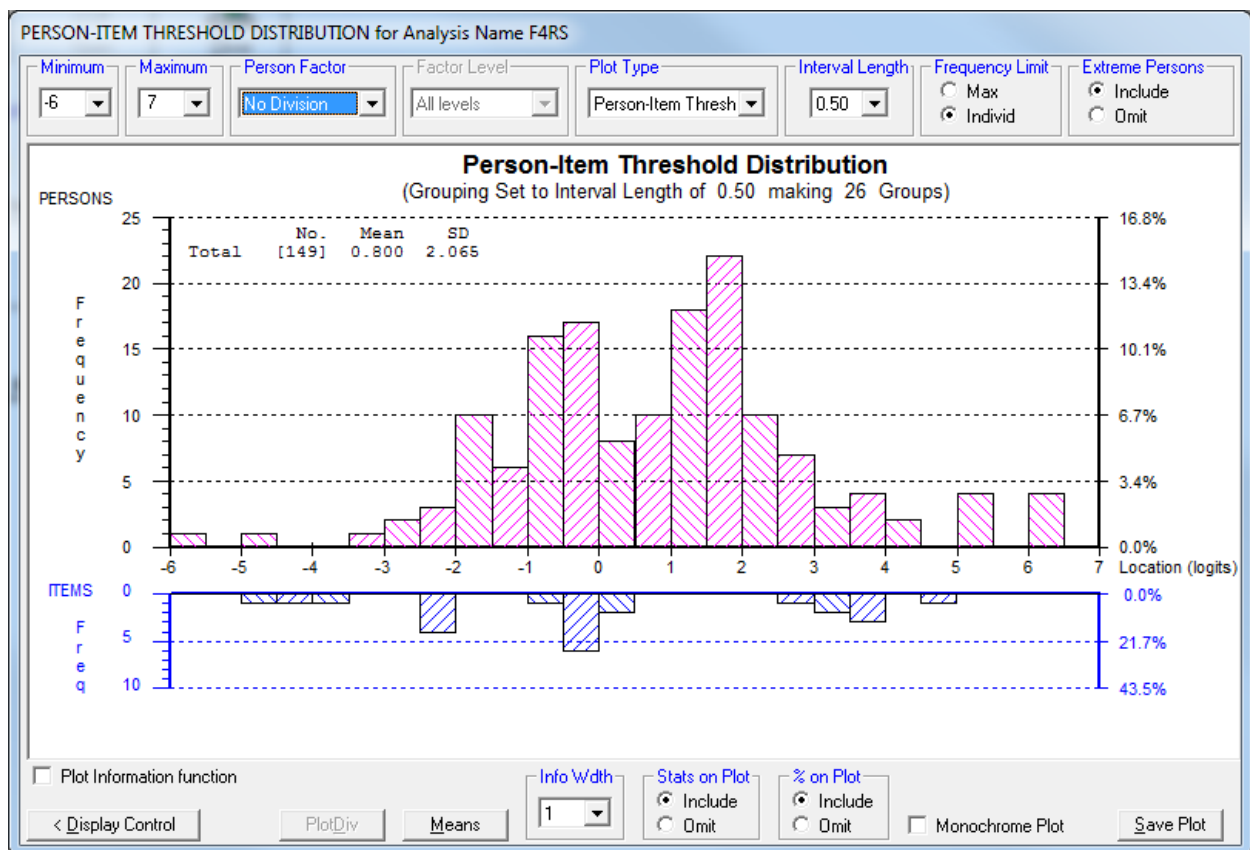


Figure 16: Overall distribution of responses for Factor 4 (Collaborative learning outcomes/opportunities)

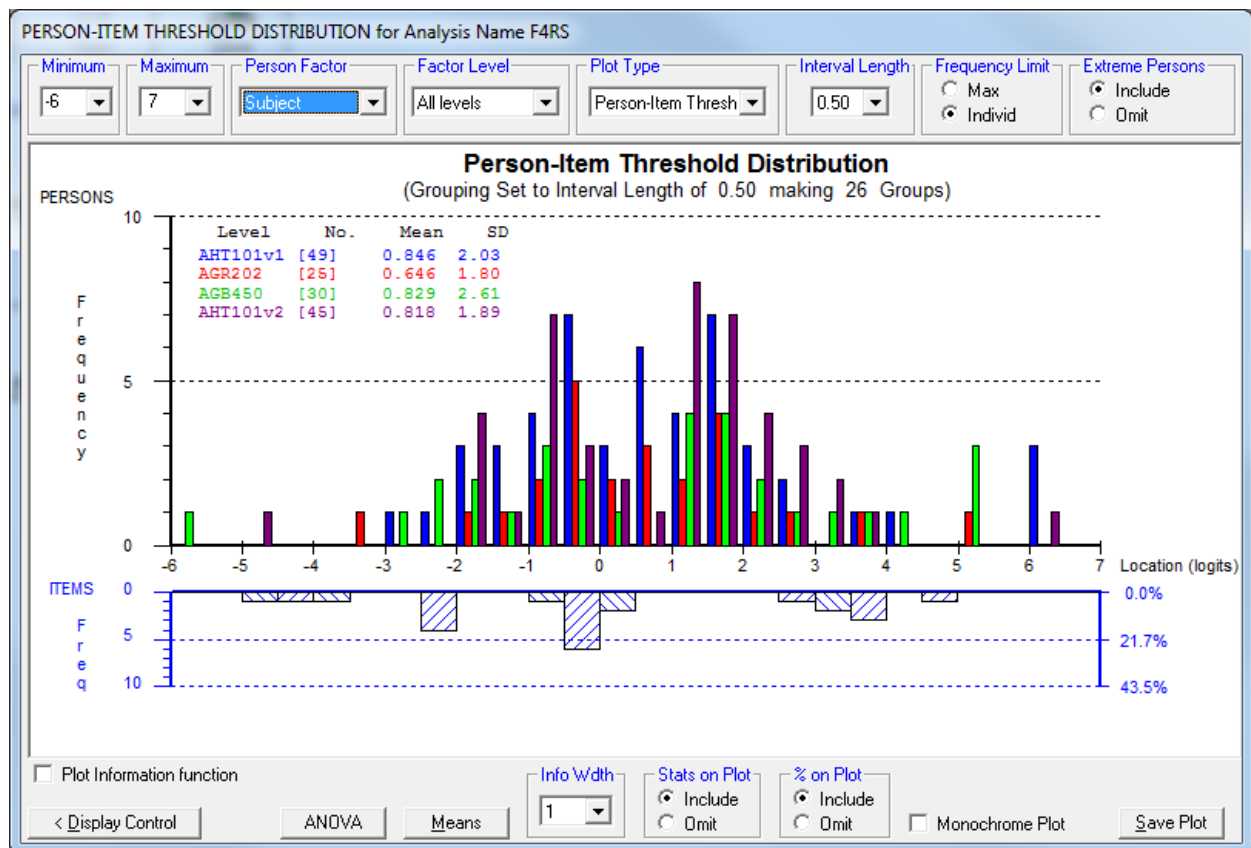


Figure 17: Factor 4 distribution by subject

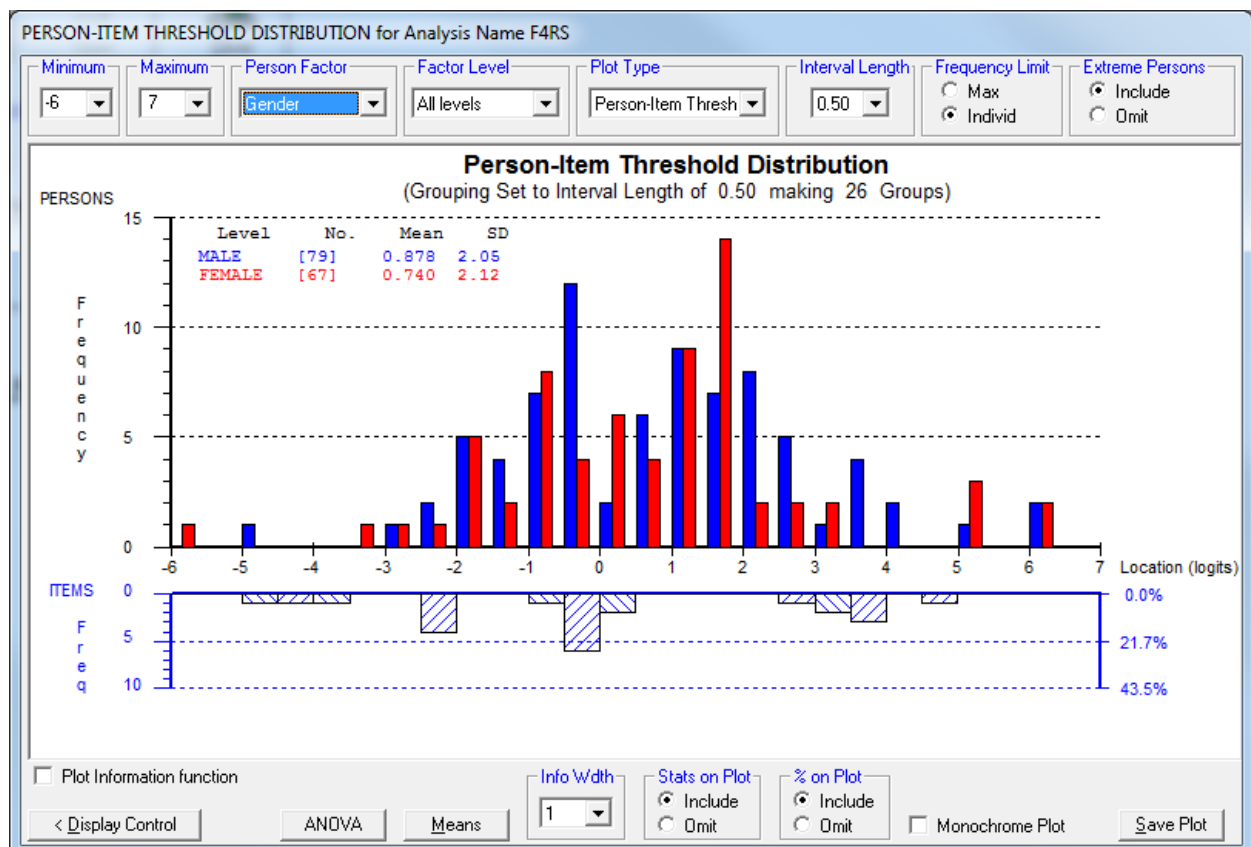


Figure 18: Gendered distribution of Factor 4

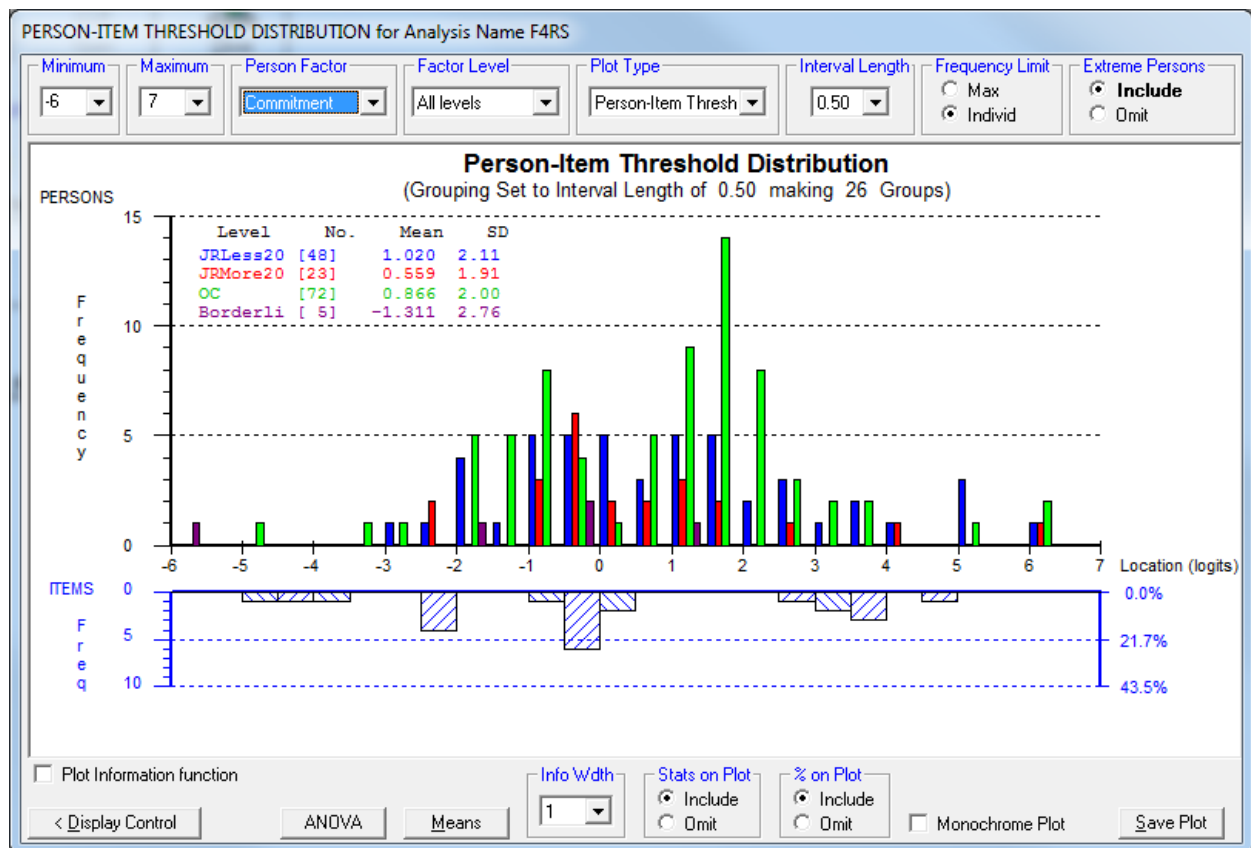


Figure 19: Distribution of Factor 4 by level of commitment

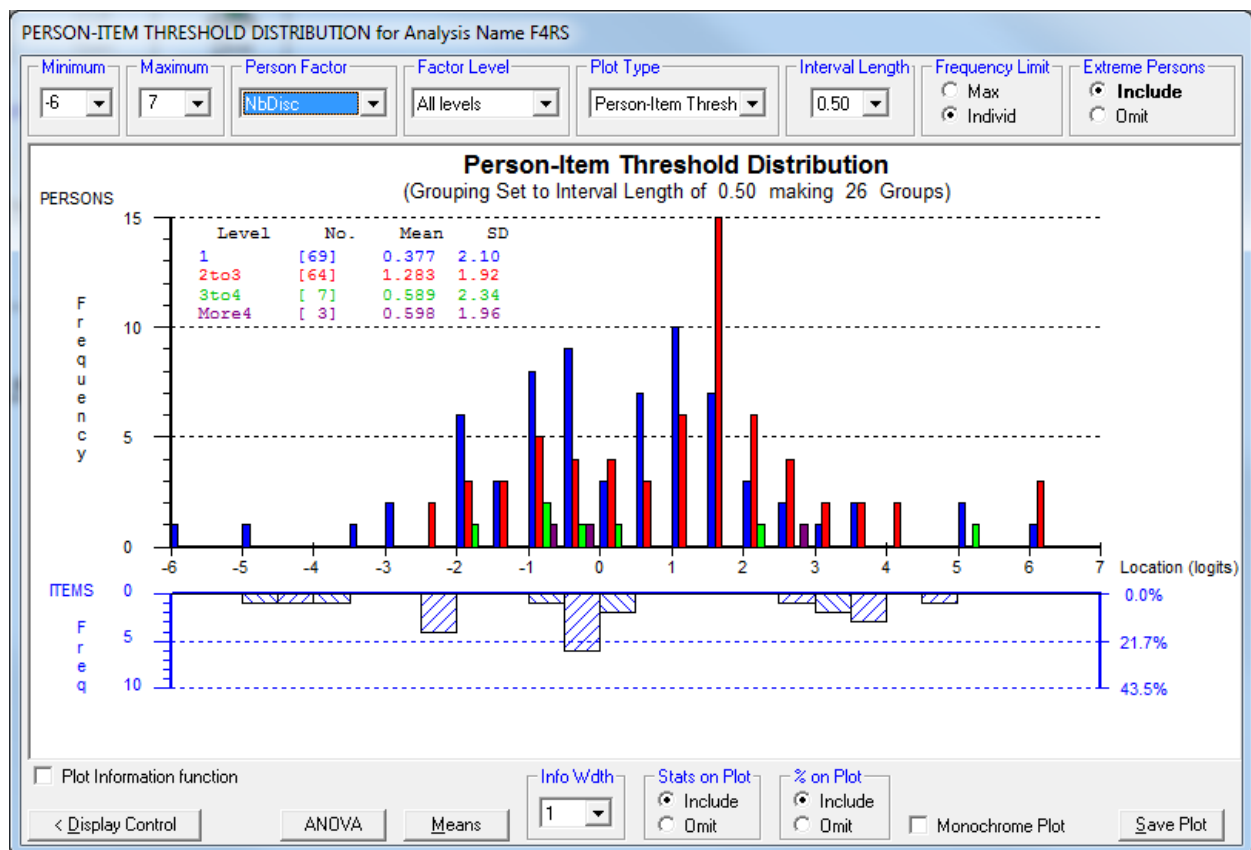


Figure 20: Distribution of Factor 4 by number of weekly synchronous meetings

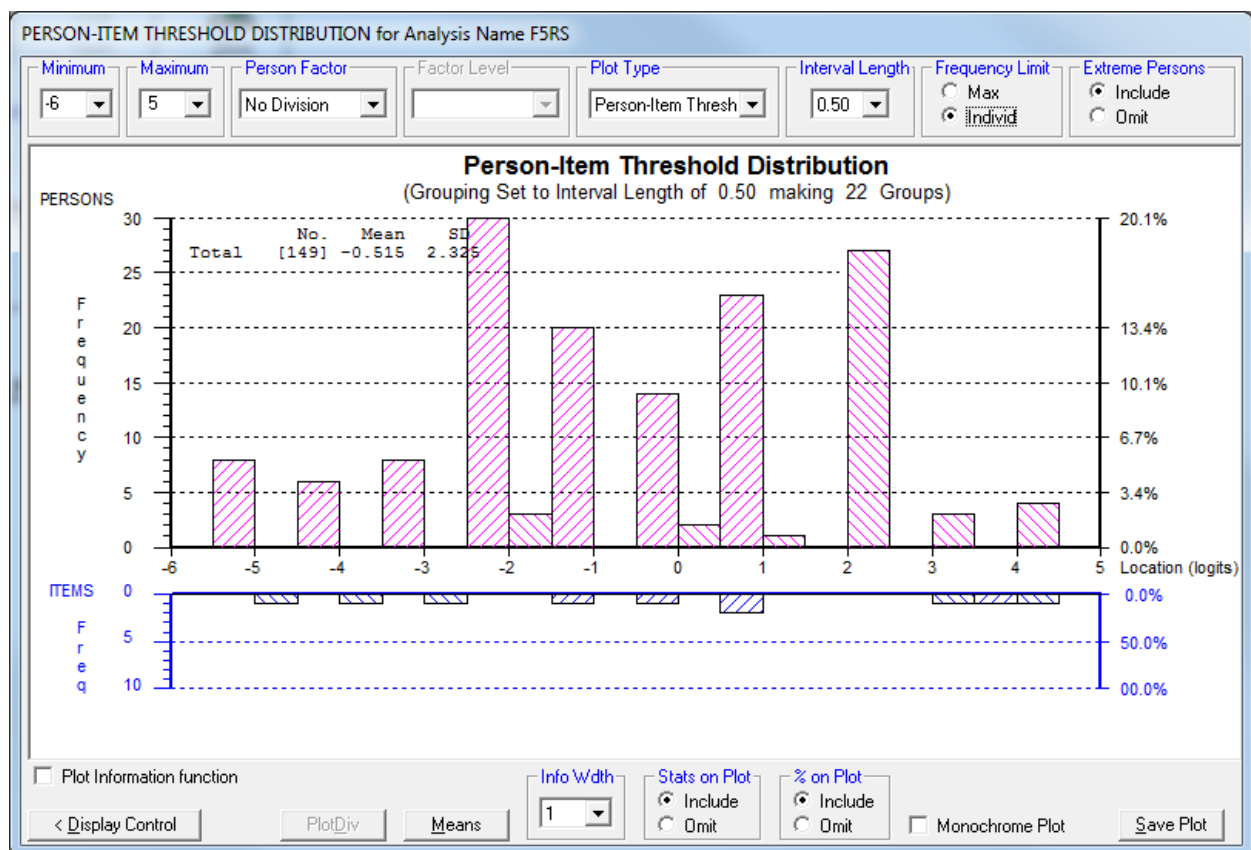


Figure 21: Distribution of Factor 5 responses (Social outcomes/benefits)

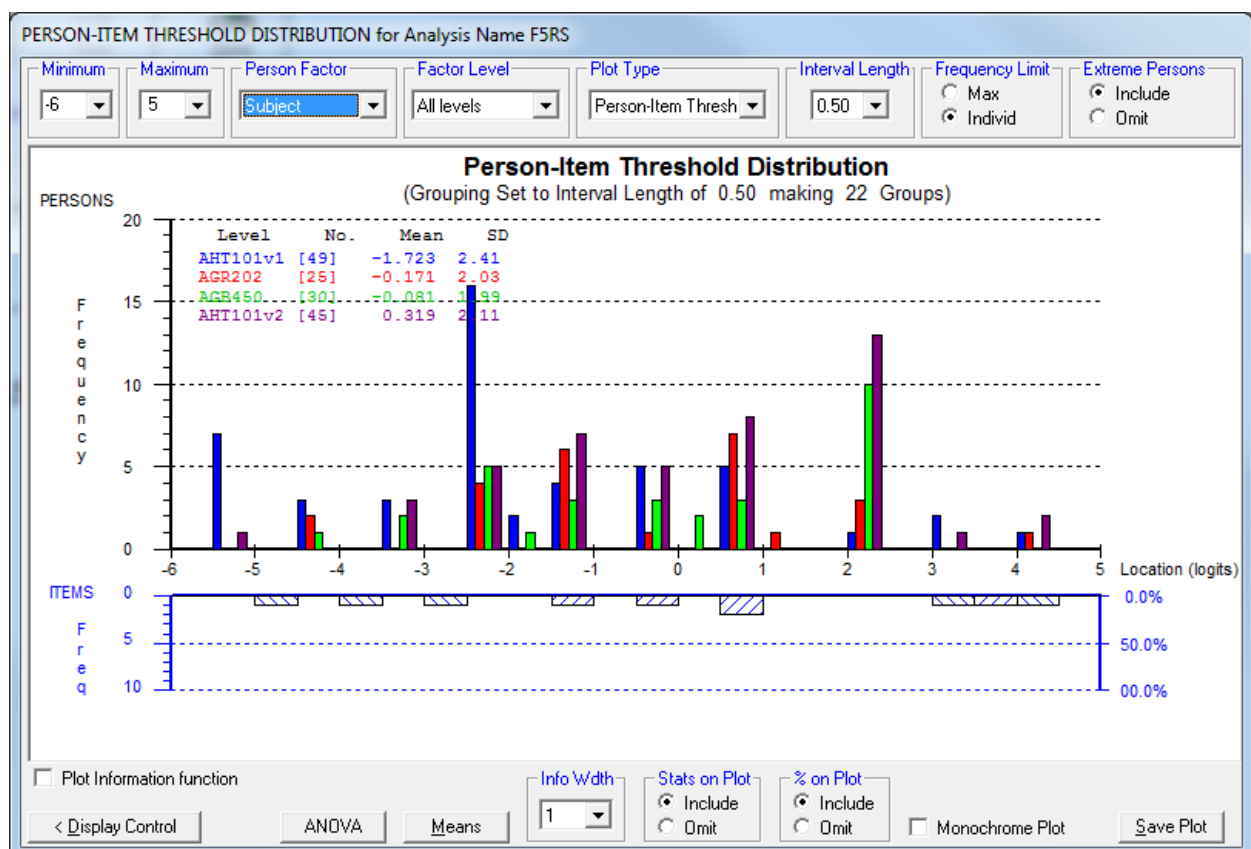


Figure 22: Factor 5 distribution by subject

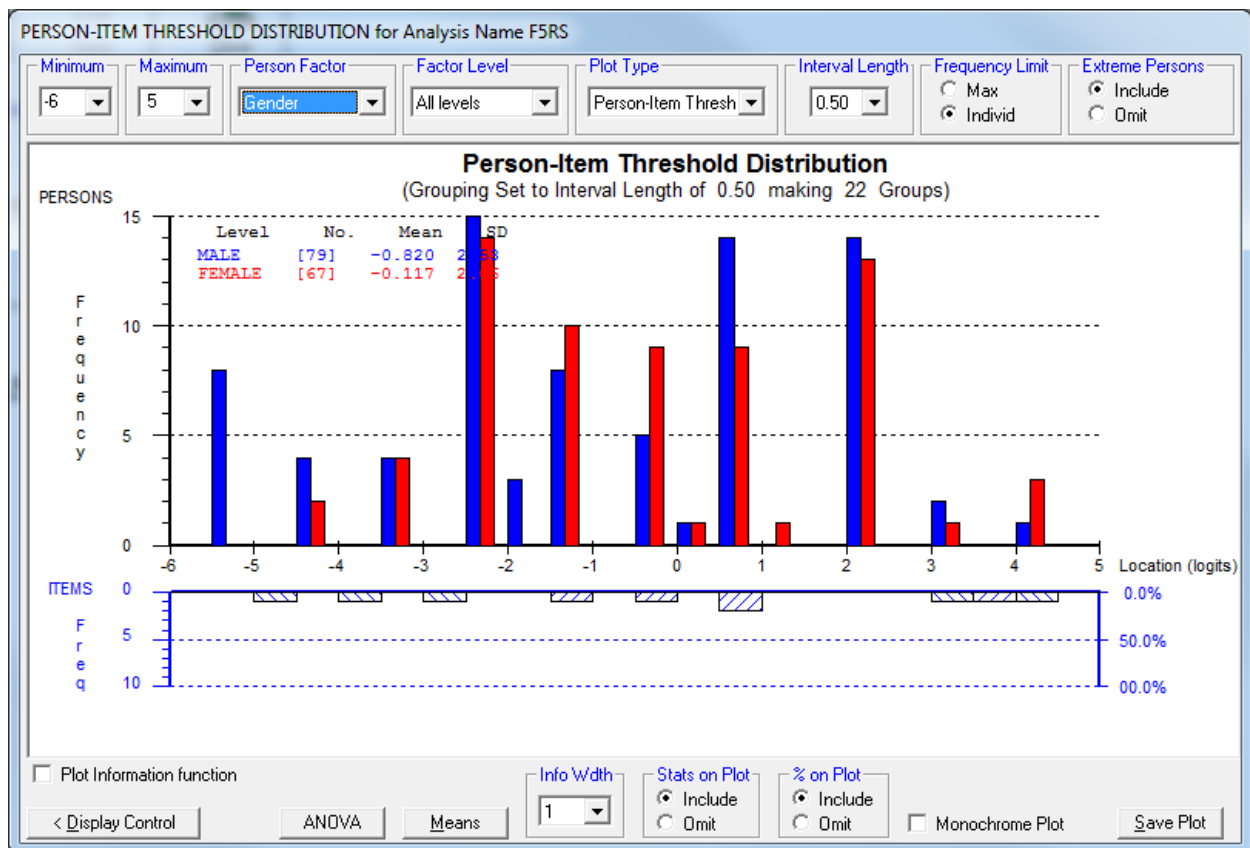


Figure 23: Gendered distribution of Factor 5

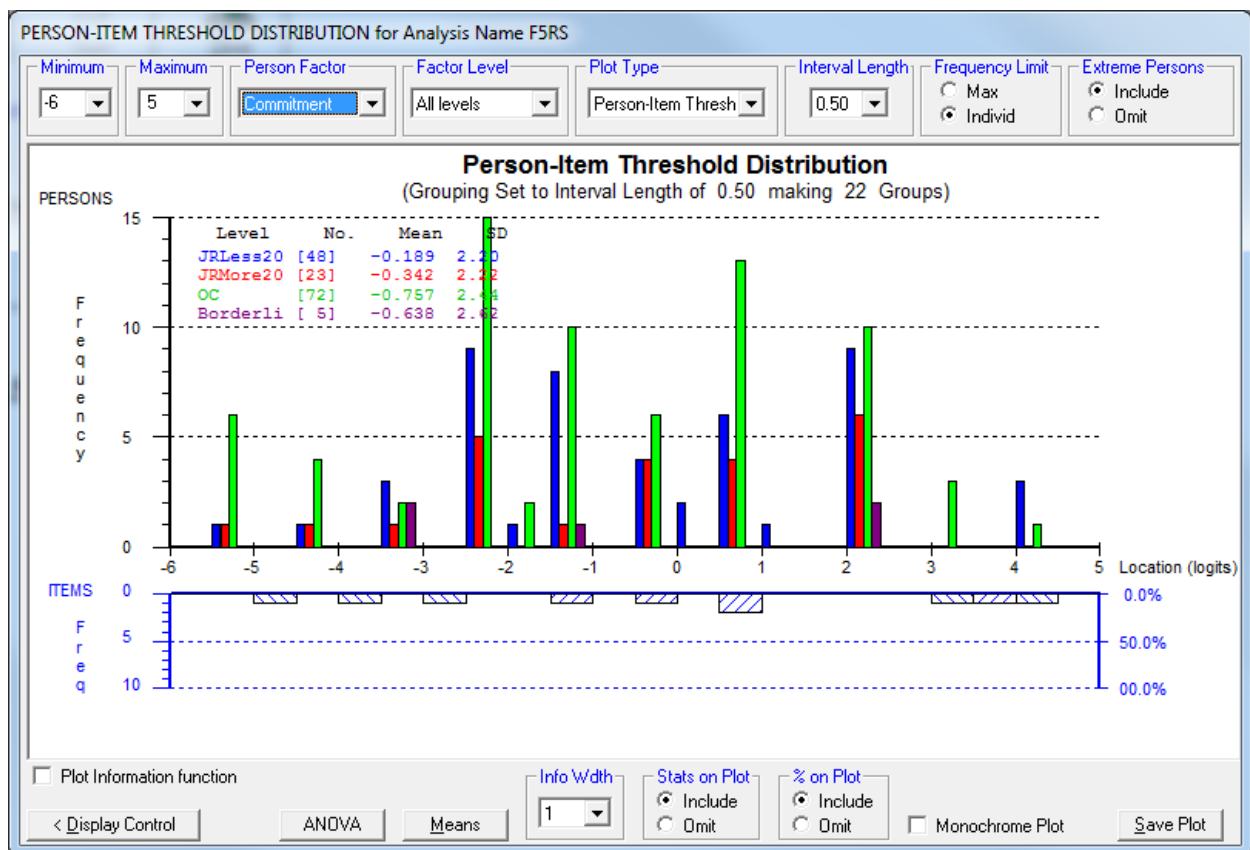


Figure 24: Distribution of Factor 5 by level of commitment

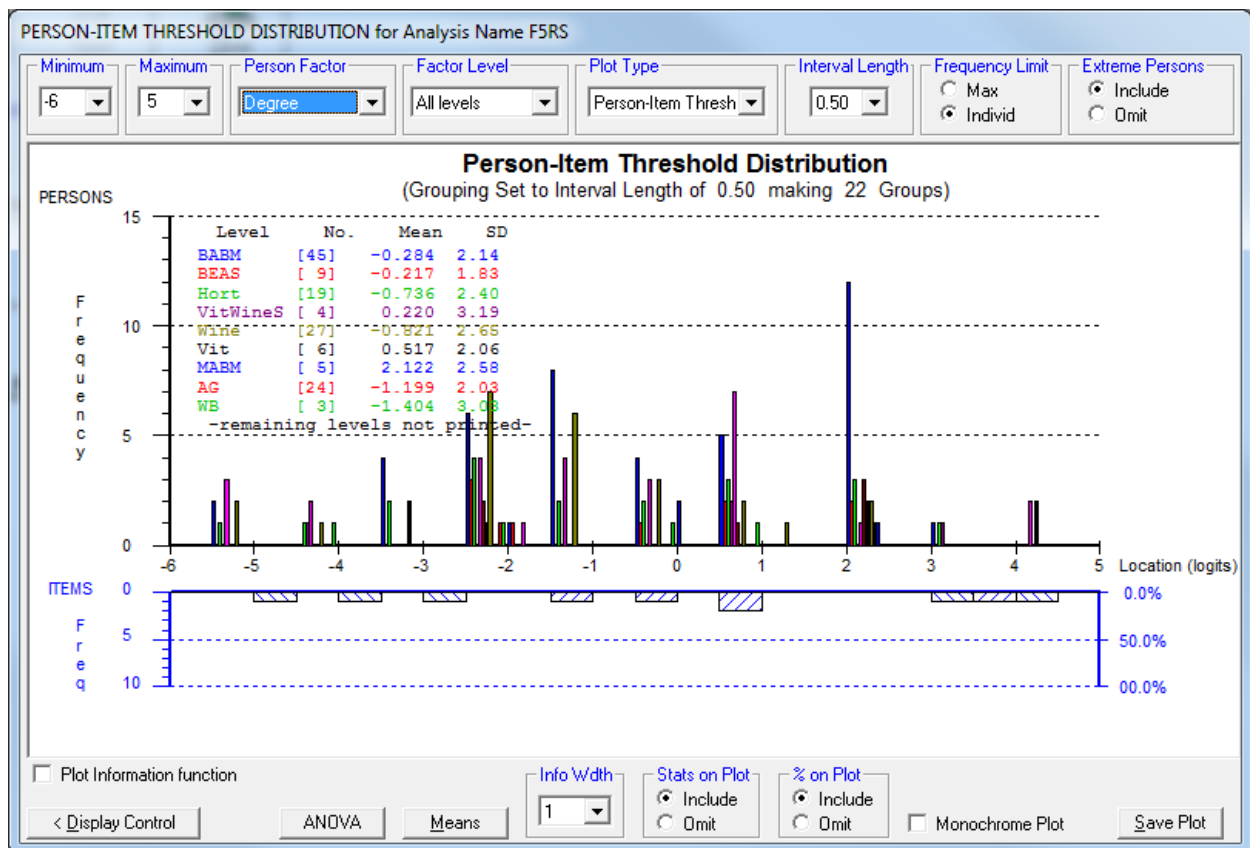


Figure 25: Factor 5 distribution by course enrolled

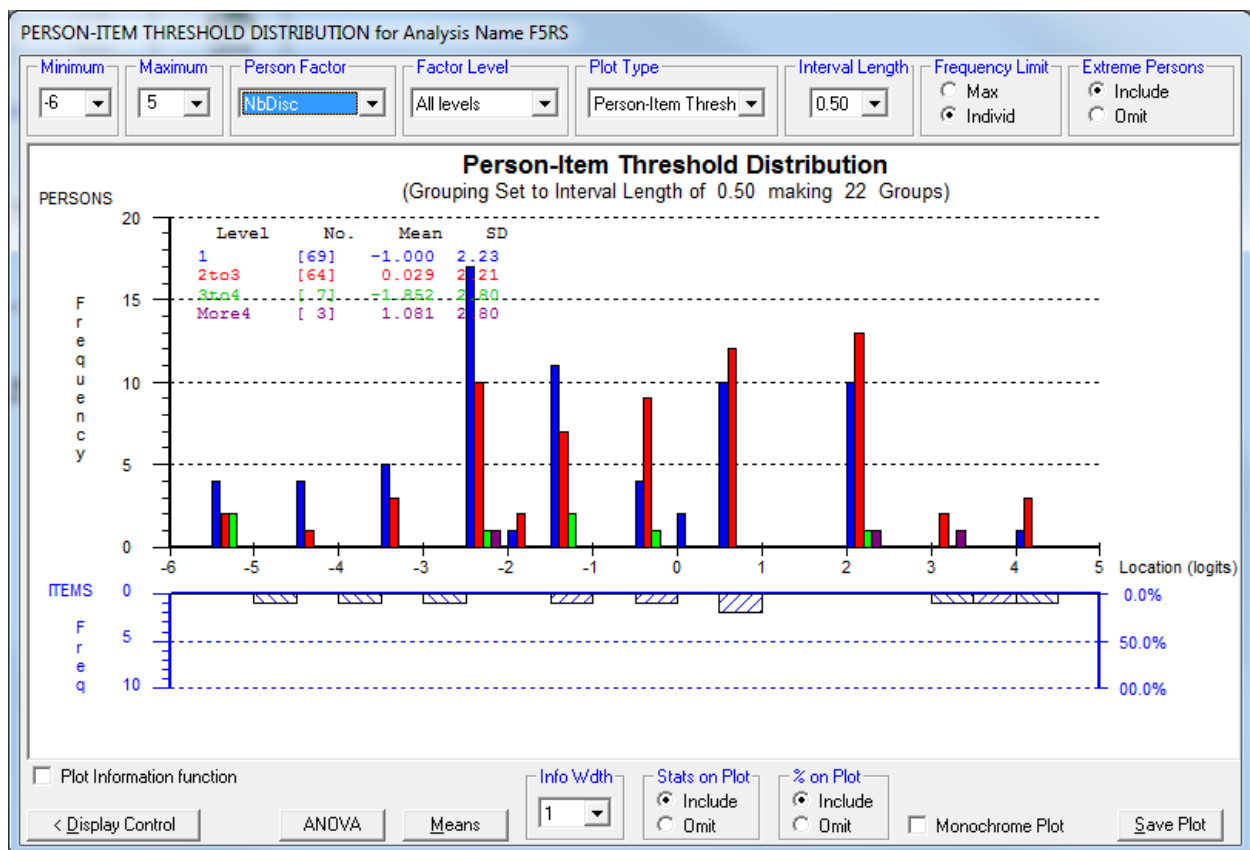


Figure 26: Distribution of Factor 5 by number of weekly synchronous meetings



## Appendix I: References

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