The Impact of Academic Staff Development on Their Approach to Teaching and Learning

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Abstract

The Approaches to Teaching Inventory (ATI) has been used to benchmark the impact of academic staff development programs in a range of different contexts over the last fifteen years.

This paper analyses, discusses and compares two large ATI data sets collected at a Swedish research university, the first data set was collected in 2009 and the second in 2012. This paper provides the results of open factor analysis of both data sets and a discussion of the differences in the nature of the two data sets through a comparison of the 2012 and 2009 analyses.

The open factor analysis of our second data set reveals a new conception of the teacher role which complements the existing transmission and conceptual change orientations. This new instructor orientation focuses on challenging student conceptions to achieve intellectual growth.

We also explore shifts in conceptions of teachers, exploring the impact of the in-service pedagogy courses we have been delivering together with the other initiatives within the Faculty of Science and Technology which aim to equip academics with a richer pedagogical palette as they pursue their teaching and learning activities. We demonstrate a statistically significant shift in staff approach towards conceptual development among staff who have completed our engineering and science education research courses.

Introduction

The concept of Scholarship of Teaching and Learning has become a well established part of educational development in higher education. The implications of adopting the scholarship of teaching and learning as an academic norm also increases the importance of understanding the impacts this has on the daily life and thinking of higher education staff.

Evaluations of educational quality, such as those undertaken by the Swedish Higher Education Authority, raise the importance of systematic quality assurance and quality enhancement for university management. At Uppsala University this resulted in the introduction of a university wide educational quality enhancement programme in 2008. The Domain of Science and Technology responded to the challenge presented by this programme by establishing a Council for Educational Development in Science and Technology with a task to promote a community of scholarly practice. The revision and continuation of the programme was approved by the office of the Vice Chancellor in 2016.

An inventory of existing practices and attitudes to education among academic staff was initiated in 2009 to explore possible effects of the enhancement programme. A review of work on benchmarking academic's approaches to their teaching practice identified the Approaches to Teaching Inventory(ATI)[1] as one of the most relevant staff attitude assessment instruments available. Furthermore related work by colleagues in Finland[2] had already used the ATI for a similar evaluation exercise. Prosser and Trigwell developed the ATI to provide insight into how University teaching staff view teaching and learning activities associated with their role at the University.

Our initial project developed and validated a Swedish language version of the ATI.[3] The first study using our Swedish ATI survey was conducted in the Faculty of Technology and Natural Sciences at Uppsala University in 2009-2010. That study identified existing approaches and attitudes among the PhD students and academic staff.

This paper reports on both studies with an emphasis on a comparison between the findings from 2009 and a those of a corresponding study conducted in 2012. In addition to exploring the continued validity of the ATI instrument the analysis also compares results between 2009 and 2012 with the goal of identifying shifts in staff approaches to teaching and learning and exploring statistically significant differences between the two data sets.

The remainder of this paper is structured as follows. In the next section we present and compare the demographics of the two data sets we have conducted using the Swedish version of the ATI. In section 3 we summarise the results of factor analysis and reliability measures for both data sets, including computation of Cronbach's alpha for the CCSF and ITTF statistical dimensions of the ATI.

Section 4 compares the results of the analysis of the two data sets and with a focus on factors that have resulted in changes in teaching approach in the years separating the studies. The final section contains our conclusions and outlines areas for future exploration.

Background

The approaches to teaching inventory (ATI) has been developed and refined over the last decade.[1] It has its origins in phenomenographic studies of teachers' attitudes to teaching and learning in the mid 1990's. Prosser and Trigwell advance the view that there is a fundamental qualitative difference between a student-centric and teacher-centric view of the learning process [4, page 408]. They argue that a student centered approach to facilitating learning focuses on the nature of the learning itself, placing the main emphasis on changing student conceptions in relation to the subject matter being studied. In contrast to this a teacher-centric approach may be characterised by a focus on issues related to subject matter content and delivery. This position is supported by the work of several earlier researchers,[5,6] and we have also recent data which supports the existence of these qualitative differences in teacher perception among computer science academics[7]

The initial versions of the ATI included a larger number of items and scales than the revised version finally proposed in 2006. Initial versions proposed a model which separated intention and strategy into two major scales, comprising four intention sub-scales and three strategy sub-scales respectively. After statistical analysis in several stages [1] they arrived at a final version consisting of sixteen items ranked on a positive scale (1-5), where 1 represents hardly ever true, and 5 nearly always true. All items are positively scored. The English language items that comprise each of the scales are reproduced in appendix B.

We relate the ATI scales to learning activity drawing on a model of learner development and the learning process developed by Entwistle. Figure 1 adapted from Entwistle[8] integrates two perspectives on the learning process and relates them to learner development of understanding and identity. We argue that a teacher's ability to facilitate student development in both these dimensions is enhanced if they adopt a conceptual change/student-centric approach in their role as teachers.

The ATI has been used in several investigations of teaching practices and outcomes in higher education. Gibbs and Coffey[9] used the ATI in conjunction with other instruments in a study that attempts to link teacher training in higher education theory to improved learning outcomes for students. Similar studies have also been conducted in Holland and Finland.[2]

Descriptive Statistics

The survey was sent to 1624 e-mail addresses obtained from the central address database of employees of the Faculty of Technology and Natural Sciences at Uppsala University in 2009 and to the same address list in 2012. Three reminders were sent to participants over the course of 12 months, resulting in 515 complete responses in 2009 and 428 responses in 2012. Background information was collected for all participants. The graphs in figures 2 to 5 show the distribution of responses by, category of employment, age, gender, course year

[1] See Prosser and Trigwell [4, pages 408,409]

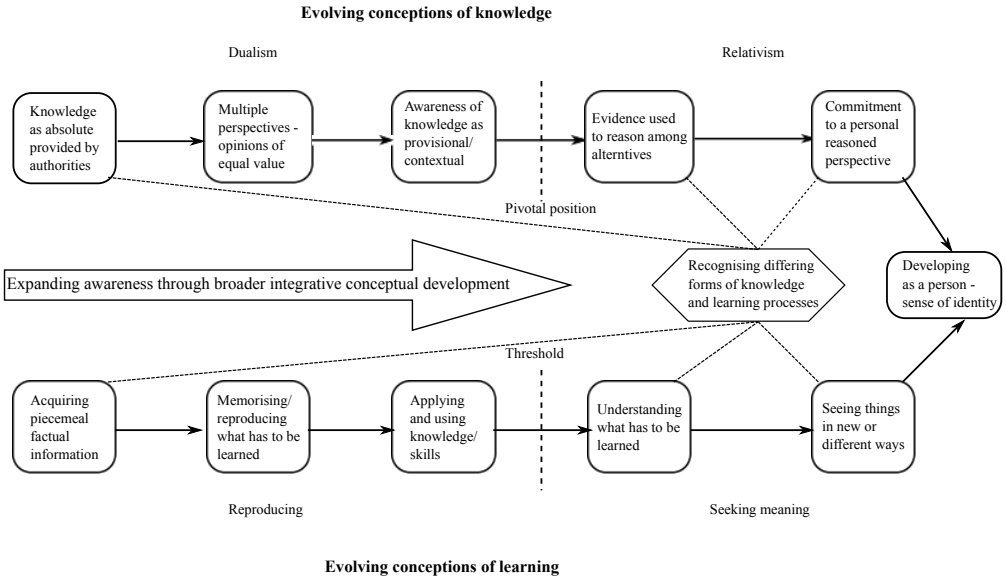

Figure 1 Entwistle's integrative model of learner development

level and a number of other variables.

The dominant group of respondents are PhD students (N2009=179, N2012=124), with lecturers (N2009=80, N2012=97) and professors (N2009=117, N2012=86) also well represented. The number of respondents for all categories of employment are shown in figure 2. The large number of responses from PhD students is due to the requirement for teaching experience for appointment to academic teaching positions in Sweden. As a consequence PhD students are actively involved in teaching in Swedish Universities and many also take courses in higher education theory as a part of their PhD studies.

A higher percentage of the Professorial cohort have answered in comparison to lecturers. This is somewhat of a surprise since professors are significantly outnumbered by lecturers in the faculty. This means that professors as a group are more highly represented than lecturers in our sample.

Distribution of responses by age is shown in figure 3.

The gender division in the sample is shown in figure 4. Not unexpectedly women constitute only thirty percent of the sample. This is not unusual in higher education in science and technology in Western countries, where women have traditionally been under-represented. The option of no answer/other was added in the 2012 survey.

Respondents identified the levels of the courses they normally taught. A good cross section of teachers teaching at all year levels from first year to PhD courses responded both in 2009 and 2012. Only about 20% of the respondents primarily teach at just one level of courses, such as master level. Most regularly teach at several different levels.

Respondents also identified any staff development courses they had taken in teaching and

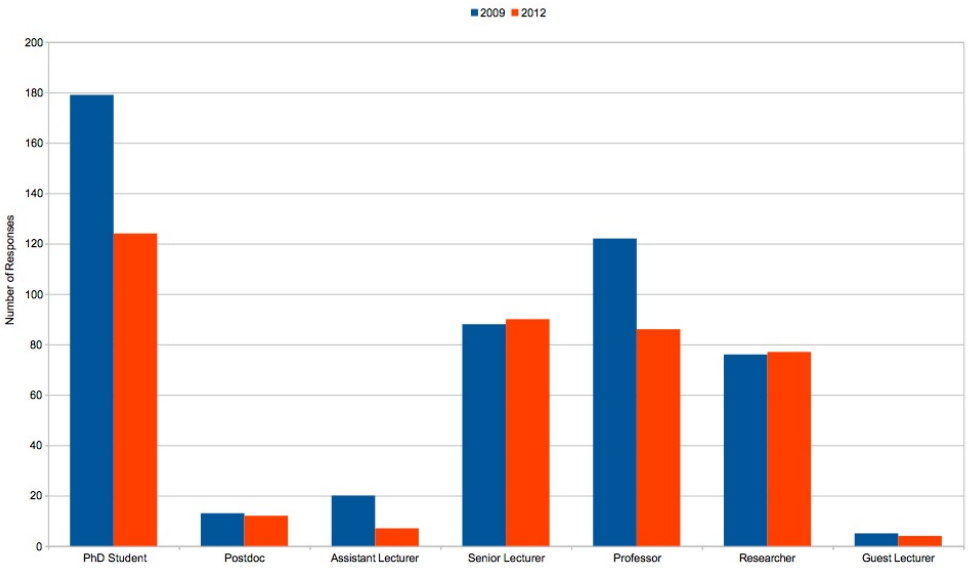

Figure 2 Distribution of Respondents by Category of Employment

learning. A majority of staff who responded to the survey had taken one or more courses, as shown by the percentage coverage in figure 5. Most highly represented was the basic course in Higher Education Teaching (University teaching, N2009=318, N2012=274) followed by a course for supervisors of research students (Research supervision, N2009=158, N2012=211). The number of respondents who had also taken a course in science and technology education or engineering education offered annually by the Domain of Science and Technology has increased in absolute numbers and also as a percentage of the sample between 2009 and 2012 (N2009=59, N2012=87).

Overall the educational theory background of the respondents is quite high and has increased over the period 2009 to 2012. This reflects the emphasis on in-service training in Swedish higher education over the last ten years. It is now standard practice that academic appointments at the grade of lecturer and above require candidates to have ten weeks of formal course-work in educational theory and practice for higher education, or documented equivalent professional experience.

Study Method

We developed a Swedish language version of the ATI directly from the version published by Prosser and Trigwell [4, page 418-419]. The English version was translated into Swedish by the first author and a colleague who was a native Swedish speaker. The resulting questionaire items were then translated back into English by another Swedish colleague and reviewed by the development group. In cases where the English versions differed significantly we reviewed and discussed the Swedish version and made revisions to address the alternative interpretation we had identified through reverse translation of the Swedish statement. The

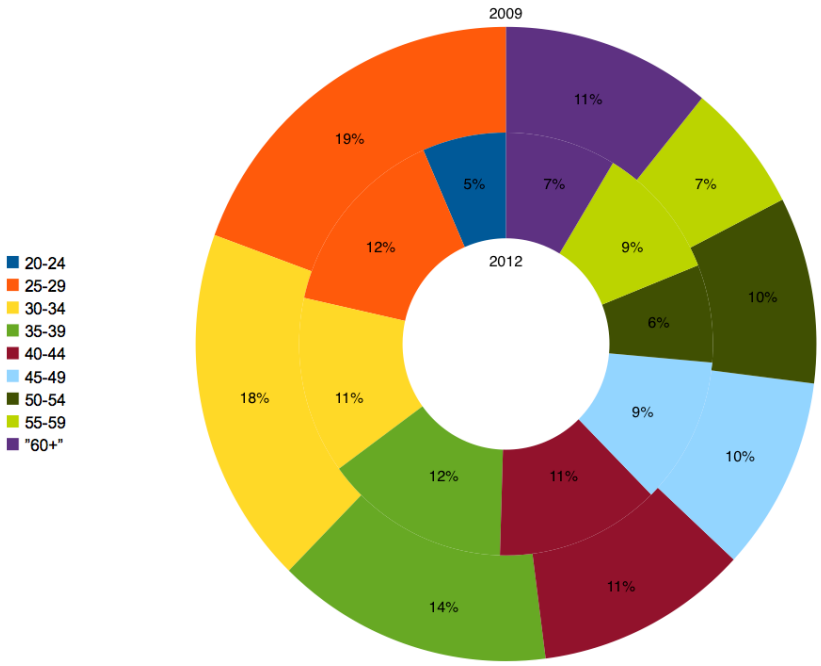

Figure 3 Distribution of Respondents by Age

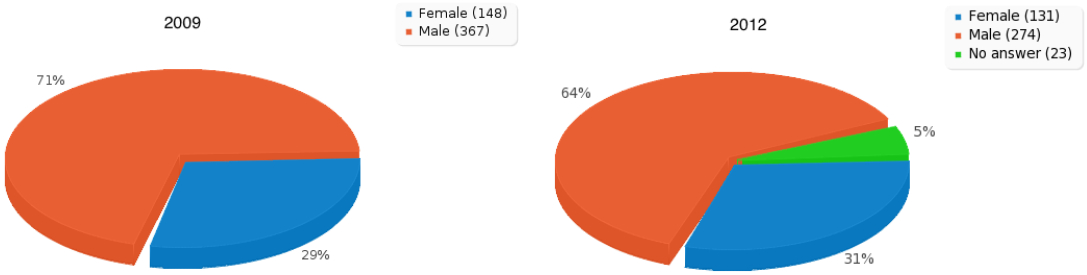

Figure 4 Distribution of Respondents by Gender

survey was piloted on a group of 8 volunteers from the pedagogical development council and further input solicited. As a result of the final review the number of demographic questions was increased to capture richer information on each participant's background experience and prior courses in theory of higher education. The final survey instrument can be found in Pears 2012[3]

Validation

In 2009 we conducted a structural analysis of the Swedish version of the ATI using the same statistical procedures as those employed by Prosser and Trigwell. The analysis was conducted in SPSS. A Bartlett's test of sphericity was significant at $p < 0.05$ and the Kaiser-Meyer-Olkin Measure of Sampling Adequacy test was 0.764, indicating that the dataset was

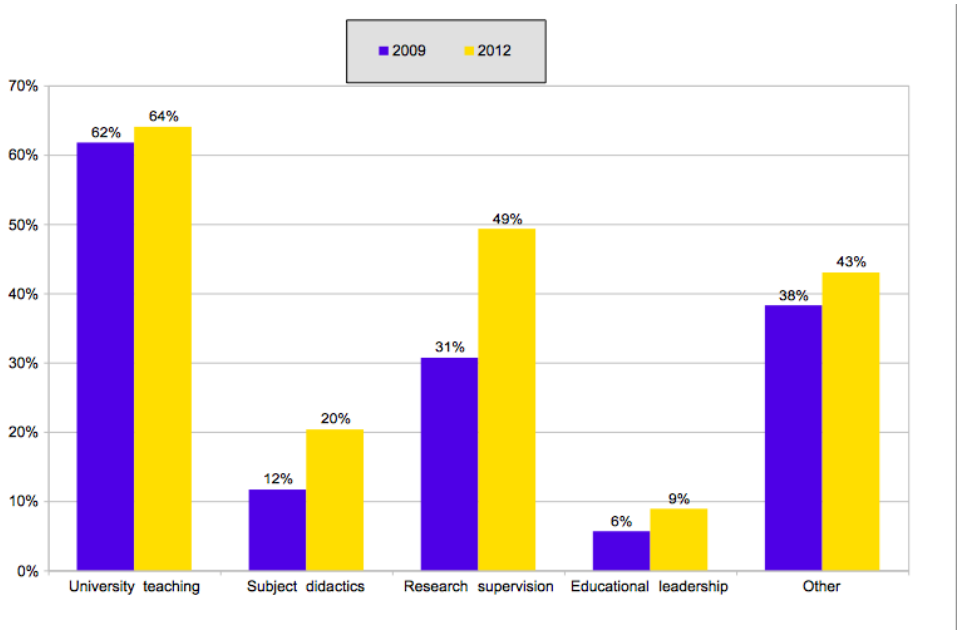

Figure 5 Distribution of Respondents by Pedagogical Education

factorable.

Several models were fitted to the data using Principal Axis Factoring. The rotation method was Varimax rotation with Kaiser Normalization. An initial factor analysis yielded four factors with eigenvalues greater than 1.0. An examination of the scree plot showed a point of inflection between the second and third factors indicating that a two factor solution should be investigated. The two factor solution yielded interpretable results and after comparisons with three and four factor solutions we concluded that this was the best fit (in common with Prosser and Trigwell[4]). Final rotated loadings for items in the two factor model for both data sets are shown in figure 6. In our 2009 data set the items in the ITTF and CCSF scales shown in figure 6 are consistent with those proposed by Prosser and Trigwell with the exception of items ITTF5 and ITTF1.

The Cronbach Alpha was computed for both scales as a measure of internal consistency. In the CCSF scale we obtain a value of $\alpha = 0.73$, in comparison to Prosser and Trigwell $\alpha = 0.74$. A value of alpha above 0.7 is considered quite good, though over 0.75 is desirable. Based on these measures we concluded that the CCSF scale was reliable for the Swedish instrument. For the ITTF scale we obtained $\alpha = 0.59$, which was improved to $\alpha = 0.63$ by excluding the non-loading item ITTF5 from the construct. For this scale Prosser and Trigwell reported $\alpha = 0.66$, which is slightly stronger than our result. However both these results are weaker than is generally desirable, and more work could be applied to refining the items in this scale to obtain higher internal consistency in responses.

For the 2012 data set, eliminating non-loading items, or isolated items, in order of importance produced a two factor model. However, in addition to items ITTF 1 and 5, which loaded weakly, or not at all in our 2009 data, we also concluded that ITTF8 and CCSF3 were no

	2009		2012	
Item	Factor 1	Factor 2	Factor 1	Factor 2
ITTF1	0.208	0.217		
ITTF2		0.575		0.700
ITTF3		0.658		0.700
ITTF4		0.416		0.610
ITTF5				
ITTF6		0.522		0.651
ITTF7		0.379		0.543
ITTF8		0.271		
CCSF1	0.458		0.524	
CCSF2	0.541		0.623	
CCSF3	0.393			
CCSF4	0.636		0.627	
CCSF5	0.465		0.635	
CCSF6	0.553		0.623	
CCSF7	0.324		0.492	
CCSF8	0.662		0.785	

Figure 6 Rotated factor matrix 2009 and 2012 data.

longer strongly loaded in the 2012 model. We interpret this to mean that our population do not experience these statements as linked to the constructs as defined and proposed by Prosser and Trigwell in 2004. The Chronbach Alpha measures for a two factor model based on our 2012 data were $\alpha = 0.65$ for ITTF, and $\alpha = 0.73$ for CCSF respectively. These values are also consistent with our previous results.

With the 2012 data an open factor analysis again produced a 4 factor model, however, unlike the 2009 data set there were strong item loadings that prompted us to investigate the potential interpretations that could be applied to the two new factors. Figure 7 shows the loading in the resulting 3 factor model for the 2012 data.

Applying a three factor model to the ATI items results in a shift of item ITTF1 from information transmission which now loads with the items traditionally identified as being associated with conceptual change and student focus. As we have previously noted, this is due to the focus on course outcomes during the Bologna process and the pedagogical development process at our university. Teachers who are committed to their teaching practice clearly are aware that well defined learning outcomes and clear course descriptions are expected of them and also value this item differently compared with fifteen years ago.

Another aspect of this the three factor model that we find particularly interesting is the items that load on factor 3, which seem to reflect a new focus or approach to teaching that emphasises going beyond the normal curriculum, being innovative and challenging student's ideas and conceptions. This approach is positively correlated with two CCSF items and negatively correlated with one ITTF item.

Item	Factor 1	Factor 2	Factor 3
ITTF1	0.553		
ITTF2		0.702	
ITTF3		0.692	
ITTF4		0.584	
ITTF5			
ITTF6		0.639	
ITTF7		0.534	
ITTF8			-0.413
CCSF1			
CCSF2			0.613
CCSF3	0.392		
CCSF4	0.719		
CCSF5	0.616		
CCSF6	0.681		
CCSF7			0.539
CCSF8	0.644		

Figure 7 Rotated factor matrix 3 factor model 2012 data.

Methodological Commentary

In the ITTF scale item 5 does not load on either factor, and item 1 loads weakly on both factors. Comparison with the results reported by Prosser and Trigwell [4, page 415 and 416] highlight difficulties with item ITTF5, where our results show no loading on either factor for both sample sets.

> "I design my teaching in this subject with the assumption that most of the students have very little useful knowledge of the topics to be covered."

On the other hand, responses to ITTF have a strong correlation with the level of courses taught by the respondent, where those teaching higher level courses generally agree less with this statement.

In contrast to the results of Prosser and Trigwell, we find a fairly strong loading on ITTF6 in 2009 and a stronger loading in 2012.

> "In this subject I concentrate on covering the information that might be available from a good textbook."

We believe that this may reflect some differences in learning culture, though both our and Prosser and Trigwell's studies draw on a significant number of responses from Swedish academics. The difference in our study is that all responses were collected from a single faculty

at a single university over the period of a year, while Prosser and Trigwell's data was collected from a wider range of contexts over a considerably longer period of time.

In addition the item ITTF1

> "I feel it is important that this subject should be completely described in terms of specific objectives relating to what students have to know for formal assessment items."

loads weakly on both factors. This can be explained by the Swedish educational context and recent reforms in higher education that have empahsised constructive alignment, and the importance of aligning instruction and assessment with desired learning outcomes at the course level. This institutional emphasis can mean that this item is seen as universally important by all staff, thus explaining the weak positive loading on both factors.

Results and Discussion

The ATI instrument allows us to explore relationships and shifts in staff approaches to their teaching duties in two major dimensions; conceptual change with a student focus, and information transmission where the focus is more on the teacher and the role of the teacher as a repository and mediator of knowledge. The absolute scale values are difficult to interpret directly and Prosser and Trigwell advise against direct use of the scale for comparison of teacher approaches. Instead the ATI is usually employed to explore longitudinal changes in attitude in the same setting, rather than as a direct indicator of teachers attitudes to teaching practice.

Using the demographic data summarised in the previous section we have explored the data to identify statistically significant differences between categories of respondent to the initial 2009 survey. We have also compared CCSF and ITTF profiles for the 2009 and 2012 data for dependent variables such as gender, category of employment and pedagogical education. These data provide indications of the efficacy of our programme of staff development initiatives, as well as revealing differences in approach between staff in different types of academic positions.

Gender differences

A gender based comparison of 2009 responses revealed a number of interesting results. Based on item ITTF1, women are significantly more likely to value detailed course description than men ($U = 24435.5$, $p < 0.05$).

> ITTF1: I feel it is important that this subject should be completely described in terms of specific objectives relating to what students have to know for formal assessment items

Men, on the other hand, are significantly more content focused than their female counterparts, and more likely to emphasise their role as a subject expert, ranking significantly higher on items ITTF3 (U = 22233.5, $p < 0.05$) and ITTF4 (U = 21598.5, $p < 0.05$).

> ITTF3: I think an important reason for running teaching sessions in this subject is to give students a good set of notes
>
> ITTF4: I feel that I should know the answers to any questions that students may put to me during this subject

In general, men rank significantly higher on the ITTF scale than women, when items 1 and 5 are excluded (U = 23148.5, $p < 0.05$). This implies that women (in the 2009 survey sample) appeared more likely to focus on the formal requirements of the course, making sure that the course conforms with university regulations and procedures. Men appeared to be more inclined to view teaching activity in terms of information transmission activities, such as giving students a good set of notes. The higher response among men on ITTF4 implies that men might have a greater personal investment in being perceived as experts in the learning context.

The 2012 data, however, gives a rather different picture. Women in that sample are significantly more likely to emphasise discussion both in class and within the student cohort. This results in women placing statistically significant positive emphasis on items CCSF4 $p < 0.004$, CCSF5 $p < 0.005$, CCSF6 $p < 0.022$ and CCSF8 $p < 0.007$, all of which focus on discussing understanding and developing a dialogue around learning. Women in our 2012 study are also less likely than male counterparts to use unclear and open examples to promote learning, answering less positively on CCSF7 $p < 0.021$. Men still rate an ability to answer any question posed to them significantly higher than their female counterparts $p < 0.007$.

Differences by Job Classification

Statistically significant trends in the data, from both study years, were identified between teachers with different positions, which connects to both experience and agency in the university teaching environment. Professors and lecturers, who generally have have more extensive teaching experience, often answer significantly different than PhD students and research staff. The differences are similar in direction for both data sets, but have increased in the data from 2012.

PhD students and research staff answer significantly higher on item 7 and 8 on the ITTF scale, signifying a focus on teaching towards the formal assessment. This is to some extent connected to the difference in teaching tasks for different staff. PhD students and researchers often teach on practical sessions that are also directly connected to assessment.

Lecturers and professors answer significantly higher on three items on the CCSF scale in both studies: CCSF 1, CCSF 5 and CCSF 7. In the 2012 study, there are also significant

differences for CCSF 2 and CCSF8. This indicate a stronger focus on student centered approaches among lecturers and professors.

Item CCSF1 deals with creating opportunity in the learning context for students to demonstrate changes in their conceptual framework, and manner of understanding the knowledge area addressed by the course.

> "I feel that the assessment in this subject should be an opportunity for students to reveal their changed conceptual understanding of the subject."

Emphasis on allowing students to express changed conceptual understanding is valued least by PhD students, followed by Researchers, Lecturers and most by Professors. This is not unexpected considering the context of the learning situations in which these categories of employees normally find themselves. One conclusion that can be drawn from this is that it might be worth investigating ways to empower PhD students to recognise the value of letting students express and discuss their conceptions in relation to the topics being studied.

This tendency to be less interactive and explorative in teaching and learning settings also emerges in a similar pattern of responses to item CCSF5, which concerns the level of conversation associated with student interaction.

> "In my interactions with students in this subject I try to develop a conversation with them about the topics we are studying."

Developing opportunity for discourse during interaction with students is, again, valued least by PhD students, followed by researchers, professors and lecturers (χ^2 (2, N=493) = 29.27, $p < 0.05$). The relative position of professors and lecturers is reversed with respect to CCSF1, but the difference is relatively small. The primary division is between PhD students and researchers on the one hand, and lecturers and professors on the other (χ^2 (2, N=487) = 23.11, $p < 0.05$).

The trend in tendency to use of difficult examples to provoke debate (CCSF7) is Researcher(highest), Lecturer, Professor, PhD student(lowest), (χ^2 (2, N=488) = 12.10, $p < 0.05$). Here, it might be expected that we observe differences, since the role of these categories of educator are rather different in most academic settings. In particular it is the Professors and Lecturers who have the responsibility for the majority of the teaching activities and for the instructional design and pedagogy of the course. PhD students are typically working as laboratory assistants and teaching assistants helping students with exercises designed by more senior staff.

Academic status and credibility is an important aspect of academic teaching, this is reflected in differences in perception in relation to ITTF4.

> ITTF4: I feel that I should know the answers to any questions that students may put to me during this subject

Being able to always answer questions (ITTF4) is ranked Professor, Lecturer (high) vs Researcher and PhD student (low) (χ^2 (2, N=487) = 13.12, $p < 0.05$). We interpret this result to mean that Professors and Lecturers, with their greater responsibility for student education, seem to feel greater responsibility for being able to answer questions on the spot. Researchers and PhD students are typically responsible for smaller and more constrained elements of classroom teaching, and thus might be expected to feel less responsibility for answering general questions about the topics covered.

Pedagogical Education

The impact of professional development of staff through participation in education and pedagogy courses can be seen for both data sets. The major courses available for the teaching staff is an initial course in Higher Education Teaching for the whole university and a continuation course in Scholarly Teaching in Science and Technology offered by the Faculty of Science and Technology. For the answers from 2009, we found a clear and statistically significant trend of increasing scores on the CCSF scale for staff taking these courses. Staff who had taken the Scholarly Teaching course also exhibited a significantly lower score on the ITTF scale. We find similar trends for the data from 2012, but with interesting shifts. Staff without any courses and those who have taken the Higher Education Teaching course have a mean value of the CCSF scale similar to that of those who had taken the Higher Education Teaching course in 2009. A further increase for those taking the Scholarly Teaching course is still significant. Staff who had taken the Higher Education Teaching course also exhibited a significantly lower score on the ITTF scale.

Conclusions

This paper analyses and compares two sets of attitudinal data collected from the staff of the Faculty of Technology and Natural Sciences , Uppsala University, Sweden. The instrument used was the Proser and Trigwell ATI survey. Our first survey was conducted during Autumn 2009 and Spring 2010 in the Faculty of Science and Technology at Uppsala, and the second survey about three years later during the Autumn of 2012 and the Spring of 2013.

Our confirmatory and open factor analysis of the data collected in 2009 confirmed the ATI structure proposed by Prosser and Trigwell. However, the same analysis analysis approach on the 2012 data showed that three ATI items no longer load on the Conceptual Change Student Focus (CCSF) and Information Transmission Teacher Focus (ITTF) scales. Eliminating these items from the analysis provides a robust two factor model, however it is interesting to note that some items of the original ATI no longer seem relevant as discriminators in terms of the original two scales.

While the ATI is not intended to be used directly as a measurement instrument, we have been able to identify some clear shifts in the approaches staff report in response to the ATI survey items. In particular, there is a strong positive correlation between the faculty courses

in didactics and increased conceptual change/student-centric focus among teaching staff and this shift is more pronounced in the responses we collected in the second study in 2012. However, since the data has been collected anonymously it is not possible to compare the two cohorts of respondents, or to make meaningful comparisons between the two populations, since the overlap in respondents is unknown.

While it might be argued that only staff who already have a strong interest in teaching and learning take these courses, it is also clear that a more aware and well educated teaching cohort emerges from this pattern of engagement. Academic staff who have taken these courses have a wider range of pedagogical tools to apply to their teaching, and a richer pedagogical understanding, both of which contribute significantly to ensuring that Uppsala University delivers education of the highest quality.

Finally we conclude that the ATI instrument itself draws on assumptions about the teaching environment and academic staff values that are no longer true in our context. This explains why three of the ATI items no longer load to either the ITTF or CCSC factors. If the ATI is to continue to be useful as a means of evaluating staff attitudes and approaches to teaching practice it needs to be revised to better reflect the attitudes and values of twenty first century university departments and teachers.

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Appendix A: Swedish ATI Items

Skala: informationsöverföring/lärarefocusserad (ITTF)	Kod
Subskala: intention att överföra information	
Jag anser att det är viktigt att kursen är fullständigt beskriven avseende de specifika lärandemål som studenterna kommer att bli examinerade på.	ATI02
Jag tycker att det är viktigt att redovisa många begrepp och mycket fakta så att studenterna vet vad de måste lära sig under kursen.	ATI04
Jag tycker att en viktig aspekt av schemalagd undervising i min kurs är att se till att studenterna får bra föreläsningsanteckningar.	ATI11
Jag anser att jag borde kunna svara på alla kursinnehållsfrågor studenterna kan tänkas ställa under kursens gång.	ATI13
Subskala: lärarecentrerad strategi	
När jag planerar min undervisning i denna kurs utgår jag ifrån att de flesta av studenterna kommer att ha mycket litet relevanta förkunskaper.	ATI01
I min kurs fokuserar jag på att gå igenom innehållet som kan återfinnas i en bra lärobok.	ATI07
Jag lägger upp min kurs på ett sätt som ska hjälpa studenterna att klara den formella examinationen.	ATI10
På den här kursen ger jag studenterna endast den information de behöver för att klara den formella examinationen.	ATI12

Skala: konceptuellförändring/studentcentrerad (CCSF)	Kod
Subskala: konceptuellförändring i fokus	
Jag tycker att examinationen i kursen ska ge studenterna möjlighet att visa hur deras förståelse för ämnet har förändrats.	ATI05
Jag uppmuntrar mina studenter att omstrukturera sina nuvarande kunskaper enligt det nya tankesätt om ämnet som de utvecklar under kursens gång.	ATI08
Jag anser att det är bättre för mina studenter att de skapar egna anteckningar jämfört med att de bara skriver ner det jag skriver på tavlan.	ATI15
Jag anser att mycket undervisningstid ska användas till att diskutera och utmana studenternas egna idéer kring ämnet.	ATI16
Subskala: studentcentrerad strategi	
När jag interagerar med studenterna på min kurs så försöker jag skapa en dialog med dem om de tema och de begrepp som ingår i kursen.	ATI03
Jag avsätter en del undervisningstid så att studenterna ska få tillfälle att diskutera sinsemellan de svårigheter de möter under kursens gång.	ATI06
Jag använder svåra eller oklara exempel i min undervisning för att provocera fram diskussioner.	ATI09
Jag skapar möjligheter för mina studenter på kursen att diskutera förändringar i deras förståelse för ämnet.	ATI14

Appendix B: English ATI Items

Scale: Information transmission/teacher-focused (ITTF)	Item no.
Subscale: Information transmission intention items	
I feel it is important that this subject should be completely described in terms of specific objectives relating to what students have to know for formal assessment items	ATI02
I feel it is important to present a lot of facts to students so that they know what they have to learn for this subject	ATI04
I think an important reason for running teaching sessions in this subject is to give students a good set of notes	ATI11
I feel that I should know the answers to any questions that students may put to me during this subject	ATI13
Subscale: Teacher-focused strategy items	
I design my teaching in this subject with the assumption that most of the students have very little useful knowledge of the topics to be covered	ATI01
In this subject I concentrate in covering the information that might be available from a good textbook	ATI07
I structure this subject to help students to pass the formal assessment items	ATI10
When I give this subject, I only provide the students with the information they will need to pass the formal assessments	ATI12

Scale: Conceptual change/student-focused (CCSF) approach	Item no.
Subscale: Conceptual change intention items	
I feel that the assessment in this subject should be an opportunity for students to reveal their changed conceptual understanding of the subject	ATI05
I encourage students to restructure their existing knowledge in terms of the new way of thinking about the subject that they will develop	ATI08
I feel that it is better for students in this subject to generate their own notes rather than always copy mine	ATI15
I feel a lot of teaching time in this subject should be used to question students' ideas	ATI16
Subscale: Student-focused strategy items	
In my interactions with students in this subject I try to develop a conversation with them about the topics we are studying	ATI03
I set aside some teaching time so that the students can discuss, among themselves, the difficulties that they encounter studying this subject	ATI06
In teaching sessions for this subject, I use difficult or undefined examples to provoke debate	ATI09
I make available opportunities for students in this subject to discuss their changing understanding of the subject	ATI14