Teacher and student perceptions of the development of learner autonomy; a case study in the biological sciences.

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Abstract

Biology teachers in a UK university expressed a majority view that student learning autonomy increases with progression through university. A minority suggested that pre-existing diversity in learning autonomy was more important and that individuals not cohorts differ in their learning autonomy. They suggested that personal experience prior to university and age were important and that mature students are more autonomous than 18-20 year olds. Our application of an autonomous learning scale (ALS) to four year-groups of biology students confirmed that the learning autonomy of students increases through their time at university but not that mature students are necessarily more autonomous than their younger peers. It was evident however that year of study explained relatively little (<10%) of total variation in ALS scores in this student population which suggests that personal and environmental/societal factors profoundly influence the degree of learning autonomy and should be a focus of future research.

Key words: learner autonomy, autonomous learning, independent learning, life-long learning, biology teaching

Introduction

There is a general consensus that in addition to subject specific expertise graduates of many (if not all) disciplines should possess the skills and personal attributes for life-long learning and in particular should possess the ability to continue their post-university learning journey autonomously or independently (e.g. AQF 2011, QAA 2007, QAA 2008,). There is also a widely held belief that university level education enables students to develop these skills/attributes (Bryde and Milburn 1990; Chemers et al 2001; Fazey and Fazey 2001; Stephenson and Laycock 1993). Furthermore, there is also a view that the development of at least some of the personal attributes (such as self-confidence) associated with independence and autonomy might be more to do with extra-curricular life, age and maturity than with the efforts made by the designers of teaching programmes (Atkins 1999). Skills and personal attributes associated with learner autonomy such as (but not limited to) self-confidence and self-efficacy, motivation to learn, the ability to set personal learning goals and the motivation to achieve them are considered to be essential by employers, educators and policy makers (Bagshaw 1997; Clifford 1999; Lambier 2005). Ismail (2011) for example has shown that independence is a key characteristic of Malaysian graduates who are successful in the post-graduation labour market. Skills related to autonomy are also increasingly recognised as being important by students themselves (Glover et al 2002; Nabi and Bagley 1998; Yorke 2004).

If we accept that an aim of higher education is to enable students to develop the skills/attributes for lifelong learning then the ability to assess the level to which a learner is autonomous and to measure the development of autonomous learning is essential for both students and their teachers. An awareness of the level of learning autonomy of their students at all stages of the learning journey will enable teachers to tailor their pedagogic approach and their expectations of their students appropriately. Similarly, through an assessment of their own learning autonomy compared to an appropriate programme/level specific goal students will be enabled to take positive actions towards self development. In partnership students, teachers and those responsible for designing, monitoring, and enhancing learning programmes will be able to ensure, and perhaps more importantly demonstrate the efficacy of programmes of study.

There exists however a myriad of inter-related definitions and interpretations of types and levels of autonomous/independent learning (Broad 2006; Macaskill and Denovan 2011). For example Loyens et al (2008) describe *self-directed learning* and *self-regulated learning* as processes during which learners function autonomously taking responsibility for planning, initiating and evaluating their own learning efforts. Betts (2004) sees the autonomous student as being an independent and life-long learner. Learning autonomy is seen by Holec (1979) as the ability to learn in a logical and appropriate manner and by Benson (2006) as the capacity by which a student takes control of their own learning. One consequence of the diversity of language used to define autonomy is that the potential exists for different researchers/audiences to interpret the terms differently, thereby weakening the power of inter-study comparisons. Based upon our discussions with colleagues and students however we believe that autonomous learning is recognised as a general concept. In the context of our own department, and the case study that is the focus of this research, it relates to the ability of students to determine their own learning goals, to manage aspects of their own learning and, to engage in a very personal way with the learning process. Members of our department would use the terms *independent learner* and *autonomous learner* interchangeably when articulating this position. In this respect we believe our understanding of autonomous learning to be similar to that of Macaskill and Taylor (2010) which relates to Ponton, Carr and Confessore (2000) and Long (1998) in stressing the psychological characteristics of autonomous learners linked to personal initiative, motivation to learn and resourcefulness.

There are a number of tools by which aspects of learning autonomy can be measured but most of them depend upon students completing long questionnaires or are aimed at a specific student population (Macaskill and Taylor 2010). However Macaskill and Taylor (2010) have developed a short autonomous learning scale (ALS) that they suggest may prove useful to educational researchers and practitioners alike. The ALS is simple to

administer being based upon just 12 statements that respondents rate themselves against using a 5 point Likert scale. Macaskill and Taylor (2010) demonstrated its applicability to a diverse student population (UK psychology students in their first year at university, and a range of students following a range of social science, law and business courses). Additionally Macaskill and Denovan (2011) showed that scores derived from the ALS can be used to measure the impact of a psycho-educational intervention designed to increase self efficacy and self esteem. In the current study we have explored teacher perceptions of student learning autonomy and in doing so we have developed hypotheses about the development of learner autonomy in the context of a typical undergraduate student Bioscience community (that autonomy increases during the period of study, that mature students are more autonomous than students entering university directly from university, and that male and female students might perceive themselves to be differently autonomous). We have used the ALS to explore the students' perception of their own learner autonomy and used the scores derived from it to test the hypotheses that we have developed.

Methods and Results

Ethical approval for this study was obtained from the relevant university ethics committee. All participants were volunteers and all provided informed consent. In order to preserve anonymity we use the terms teaching faculty and teacher when referring to respondents rather than the academic titles Lecturer, Senior Lecturer and Professor more usually used in a UK higher education context.

Participants

To explore the perceptions of teaching faculty of the learning autonomy of their students all members of staff (excluding the authors of this paper) who teach biology at both campuses of the University of Hull (Hull and Scarborough) were invited to participate in a face to face interview (n = 28). Fifteen members of staff agreed to take part, 9 male and 6 female. Five of them had been teaching at university level for more than 15 years, 5 for more than 7 years and 4 for fewer than 2 years. Between them they represented the breadth of biology characteristic of our department (ecology, animal behaviour, biomedical science, molecular biology, evolutionary biology and environmental biology/management).

Students enrolled on biological sciences degree programmes delivered at the University of Hull campuses at Hull and at Scarborough were invited (by email) to complete a paper based questionnaire on a range of topics related to their experience of university and their attitudes to learning (part of a larger on-going program of research). Of the 84 students who

completed the questionnaire 22 were at the pre-certificate stage, 27 were first years, 14 second years and 21 in their third and final year of study. Fifty one were female and 33 were male. Fifty of the students provided information about their age at entry to university. Thirty-three of them were 18 to 20 years old (31 aged 18 and two aged 20) and 17 were 21 years old or older (range 21 to 56 years). We appreciate that this student sample is a self selecting one and therefore may only represent one portion of the wider student population (although we have no reason to believe that they are in any way atypical).

The perceptions of teaching faculty of the learning autonomy exhibited by their students

In order that we might understand the perceptions of teaching faculty of the learning autonomy of their students we adopted an inductive approach involving the thematic analysis (Boyatzis 1998) of responses to three specific questions posed during a 20 to 30 minute semi-structured one to one discussion with JF. The discussion was about the interviewees approach to teaching and was designed to provide them with an opportunity to reflect upon student learning autonomy in a broad sense.

The specific questions asked that are of relevance to this paper were derived from our own experiences of teaching and from our understanding of the literature concerning student learning autonomy. They were:

1. Do you believe that the students within one year group are more likely to be autonomous learners than others?
2. We wondered if there was a progression towards increasing autonomy as students go through university – do they become more autonomous?
3. Are some groups of students more autonomous as learners than others?

Responses to these questions were transcribed and NVIVO v8 was used to facilitate coding of emergent themes. Following initial coding (by JF) themes were developed by the authors independently in the first instance and then as a group in order that over-arching themes might be agreed. Reiterative re-coding was carried out by JF and finally all members of the research team were involved in a comprehensive analysis of the data and in the development of hypothesis derived from this analysis to be tested during a subsequent quantitative analysis using data derived from student perceptions of their own learning autonomy.

Teaching faculty perceptions of student learning autonomy: are different year groups and/or different student categories differently autonomous?

All members of the teaching faculty recognised a range of levels of learning autonomy exhibited by the students with whom they interacted. The majority (twelve out of fifteen) held the firm view that students developed in their autonomy as they progressed towards graduation. Often perceptions of increasing learner autonomy were linked to concepts of academic success. For example one teacher describing an increase in autonomy as students moved from first to second year observed that, "*the ones who are struggling in second year are the ones that haven't necessarily got their independent learning strategy together by then*".

In contrast however, three members of the teaching faculty expressed the firmly held opinion that inter year group differences in autonomy, and therefore progression in the development of autonomy towards graduation, did not exist. Their view was that individuals rather than year groups vary in their learning autonomy; "*I don't think there are groups I think there are individuals* [that are more autonomous] *and that depends entirely on background".*

Several explained that the teaching programme was designed to facilitate the development of autonomy and that their individual teaching practice (typically more closely supported learning at the initial stages and less closely supervised independent learning at the final stage) should result in students becoming more autonomous. For example one teacher, describing a second year module, explained , "i*f they're* [the students] *coming to learn with me I expect them to remember what they did in the first year and I'll reinforce it a bit,..., but then they've got to apply it and use it more independently*." Another was less equivocal in their view feeling that only some of their practice promoted autonomy while some did not, "*I think the lectures that I do don't particularly encourage that* [learner autonomy] *but through the assessments I think I try to*". A common theme during these discussions was a distinction made between the lecture as a mode of information transfer that did not promote autonomy, "*I just give them information*", and active learning strategies that were seen as crucial to the development of autonomy as the following extended response illustrates:

"*An example of this* [teaching promoting learner autonomy] *is a second year module where the first part was very much the classical do this, do this, do this, record that, which I hate. So* [in the second part of the module] *I had something which was far more independent in terms of giving the students some data, introducing the tools with which they can analyse that data and then running sessions where they* [the students] *would have free reign to explore the use of those tools while I was working with them.* [Students] *learning by saying*

ok I've got data ***how can I*** *analyse it? Rather than I've got this data* ***how do you*** *analyse it*?" (author emphasis).

Two teachers discussed the danger that too much support at the initial stage might lead to the development of a dependency culture that was hard to break (a barrier to the development of autonomy), e.g. "*You'd anticipate that* [student learning autonomy would increase] *third years should* [be more autonomous] *because they've spent longer in our system and should hopefully have had more encouragement to become independent learners, but if you get it wrong in the early stages and if you spoon-feed at an early stage that will encourage a dependency culture*". Several teachers felt that the lower levels of autonomy they perceived amongst pre-certificate and first year students were an unwelcome result of learning experiences prior to coming to university (although the transcripts provided no concrete information upon which to base this assumption). These teachers were of the opinion that students might arrive at university more able to learn autonomously than they currently do, one stating "*first years are less likely to be independent learners because....they are still kind of in a 'school' culture. I think they haven't quite grasped the importance of taking responsibility and being independent*".

Although we did not specifically seek information about teacher perceptions of the differences between mature students (twenty one years old or more at entry to university) and those entering university at eighteen to twenty years old, straight from school/college level education, it was common for teachers (n = 9) to raise this as an important theme. The majority view (expressed by six of them) was that mature students, at whatever level of study, were more autonomous as learners. In support of this view they described mature students as being more experienced and more confident, possessing a wider range of relevant skills and being more determined to succeed, e.g. "*mature students because they've made a conscious decision to come back [into education] and so they want to learn and they want to put in extra effort*" and "*my perception is that mature students are perhaps more likely* [to be autonomous learners] *because they've had more experience in industry or whatever managing their own time, being independent thinkers."* There was also a perception that mature students were somehow able to influence levels of autonomy of their younger peers, "*if you get more mature students in the group that tends to drag the level up*" but the mechanism by which this might happen was not proposed.

Two teachers stated initially that they were not sure that mature students were intrinsically more autonomous, but through active reflection during the interview concluded that they probably were. The one teacher who felt that mature students were less autonomous

referred to a lack of confidence which prevented these students from demonstrating the level of autonomy that s/he felt they were capable of, as illustrated in the following extended quotation taken from a teachers' reflection upon the mature students entering the pre-certificate stage of our provision:

"*I think the pre-certificate students need a lot of support but that comes a lot from the fact that some of the mature students come back into education and maybe they lack confidence. Not confidence in the fact that they can do it. It's more confidence in their knowledge and the fact that they think these young students are going to be much cleverer,...., it's building that confidence with them and as they go through the course they see their marks and they do really well,....,and you say you can do this work."*

Quantitative analysis of student learning autonomy

Based upon our analysis of the perceptions of our teaching faculty we developed two working hypotheses: firstly that student learner autonomy will increase as students progress through our degree programmes, and secondly that mature students exhibit a higher degree of learning autonomy than students entering higher education straight from tertiary education. To test these hypotheses (and the additional null hypothesis male and female students do not differ in their learning autonomy which was derived from our own observations rather than that of teacher study population) we carried out a quantitative analysis of the perceptions of students of their own learning autonomy as revealed by their responses to the 12 statements that are the basis of the Autonomous Learning Scale (ALS) of Macaskill and Taylor (2010) (the statements are listed in table 1). They were required to indicate on a 5 point Likert scale the level they felt each of the ALS statements described themselves. The scale ran from *Very like me* at one end to *Not at all like me* at the other. In the questionnaire the numerical codes of responses varied such that in some instances a score of 1 indicated high autonomy but in others it indicated low autonomy. Prior to analysis however all data were re-coded such that low scores (1 being the lowest) indicate low autonomy while high scores (5 being the highest) indicate higher autonomy.

Factor analysis was used to confirm that the ALS was as applicable to a community of biology undergraduate students at a range of levels of study and to derive numerical scores indicative of the perceptions of students to aspects of their own learning autonomy. Linear regression was used to test the hypothesis that autonomy increases as students progress through university and one-way analysis of variance (ANOVA) was used to test the hypothesis that the students of some year groups perceive themselves to be more autonomous as learners. Linear regression and t-tests were used to test the additional

hypothesis that more mature (older) students perceive themselves to be more autonomous than those younger students coming to university directly from school (at 18 to 20 years of age) (see below). T-tests were also used to compare the ALS scores of male and female students. All quantitative statistical analyses were carried out using the software package SPSS v18.0.

Exploratory factor analysis (principal components analysis (PCA) with varimax rotation) of the 12 items in the ALS revealed two principal components with initial eigen values of 3.75 and 2.30 accounting for 31.3% and 19.2% of the variance respectively (the two-factor solution converged in three iterations). We acknowledge that there is a widely held view that 100 is a minimum required sample size for meaningful factor analysis and that because our sample size (84) falls below that threshold caution may be required in the interpretation of our results. However it is also possible to statistically confirm the adequacy of a factor analysis via an assessment of the Kaiser-Meyer-Oklin statistic and Bartlett's coefficient of sphericity associated with it (Tabachnik and Fidell 2001). In the case of our data a Kaiser-Meyer-Oklin value of 0.761 and statistically significant Bartlett's coefficient of sphericity (π^2 = 303.1, 66 d.f., p <0.001) confirm the validity of the analysis (Tabachnik and Fidell 2001). The factor loadings of the elements of the ALS upon the two components are shown in Table 1.

Factor 1 consisted of seven items (Table 1), five of which (ALS statements 1,2,3,4 and 8) were also found to load heavily on the same factor in the study by Macaskill and Taylor (2010) and were defined by them as being related to "*learning and study practices, reflecting issues of time management, procrastination and attitudes to lone working*" and were termed "*Study Habits"* by them. Our analysis linked two additional items (statements 5 and 6), *I tend to be motivated to work by assessment deadlines* and *I take responsibility for my learning experiences* to this group. Factor 2 comprised five items (Table 1) and is a subset of a second equivalent grouping identified by Macaskill and Taylor in that it includes five of the seven ALS statements defined by them as being related to "*elements of responsibility for learning, openness to experience and intrinsic motivation, with an element of self-confidence in tackling new activities*" and termed "*Independence of learning"* by them (Macaskill and Taylor 2010, p353). Whilst we agree that item 5, *I tend to be motivated to work by assessment deadlines*, could be seen as revealing a student's intrinsic motivation (as suggested by Macaskill and Taylor) we also see it as being related to time management and so it is no surprise to us that is linked by the PCA to the items which together define factor 1. However item 6, *I take responsibility for my learning experiences,* clearly has most in common with the items forming factor 2 and so the divergence of our factor structure from that of Macaskill and Taylor at this point is less easy to explain. However we feel that there is sufficient agreement between the structure revealed by our analysis and that of the

two analyses reported by Macaskill and Taylor (2010) for us to adopt their labels for our factors; we have therefore labelled factor 1 *Study habits* and factor 2 *Independence of learning*.

Student learning autonomy – relationships with year of study and student age

To test the hypotheses that students' perception of their learning autonomy increases as they progress through university and that mature (older) students are more autonomous than those coming to university directly from tertiary education we derived for each student a single value which we have defined as their autonomy score (A_s) (A_s = sum of scores for the 12 ALS statements – after recoding when appropriate). Because PCA revealed two interacting, but separate, factors related to autonomy we also derived for each student A_sF1 and A_sF2; the sums of their scores for those statements contributing to PCA factor 1 and 2 respectively (see Table 1).

Linear regression of A_s against year of study revealed a statistically significant positive relationship between the two variables ($F_{82,1} = 6.2$, $p = 0.015$) indicating that students become more autonomous as they progress through university. R^2 equalled 0.07 hence only 7% of the variation in the students' perception of their autonomy in learning was dependent upon their year of study. Analysis of variance with post hoc Tukey pair wise comparisons to compare the mean A_s of the four year-groups confirms that differences in A_s exist between year groups (Table 2). The analysis reveals that whilst there is a statistically significant difference in the A_s scores of pre-certificate and second year students (pre-certificate students having the lowest score of all year groups and second years having the highest) no statistically significant differences are apparent between first, second and third years.

Linear regression of A_sF1 and A_sF2 against year of study revealed the existence of a statistically significant positive relationship in the case of the former, *Study habits* (A_sF1, $F_{82,1} = 8.4$, $p = 0.005$, $R^2 = 0.09$) but not the latter, *Independence of learning* (A_sF2, $F_{82,1} = 0.2$, $p = 0.59$, $R^2 = 0.003$). Analysis of variance to compare the mean A_sF1 of the four year groups confirms that statistically significant differences exist between year groups (Table 2) and post hoc Tukey comparison reveals that the mean for pre-certificate students is significantly lower than that of third year students but that neither pre-certificate nor third year students differ significantly from first and second years. Analysis of variance to compare the mean A_sF2 of the four year-groups revealed no significant differences between them (Table 3).

Linear regression of autonomy against age of students revealed no statistically significant relationships (A_s, $F_{48,1} = 1.9$, $p = 0.17$; A_sF1, $F_{48,1} = 1.2$, $p = 0.28$; A_sF2, $F_{48,1} = 1.4$, $p = 0.24$). T-tests to compare mean A_s, A_sF1 and A_sF2 scores of younger (18-20 years old at entry to university) and older (21+) students revealed no significant differences (A_s $t = 0.5$, 48df, p

0.6; A_SF1 t -0.3, 48df, p 0.8; A_SF2 t = 0.6, 48df, p 0.5). T- tests to compare median A_S, A_SF1 and A_SF2 scores of male and female students revealed no significant differences in any case (A_S t = 0.6, 83df, p 0.5; A_SF1 t = 1.7, 82df, p 0.08; A_SF2 t = 1.4, 82df, p 0.2).

Discussion

Whilst all of the teachers interviewed in our study recognised between-student differences in learning autonomy they differed in the pattern of learner autonomy that they described. Most teachers saw a progressive development of autonomy as an outcome of time spent at university (as students 'attain' certificate, diploma and ultimately degree level educational status). Application of the ALS to biology undergraduates supported the formal hypothesis that we developed based upon this perception; that autonomy increases during the period of study. This is in agreement with the findings of Freed (1997), Fontaine (1996), Dixon (1992) and Durr (1992) (reviewed by Derrick et al, 2007) all of whom have shown that prior educational level has a positive bearing upon various measures of learner autonomy/self-direction in a range of contexts.

However, some teachers saw different levels of autonomy as being a quality of different student categories, (i.e. mature students were seen by some as being intrinsically more autonomous than school leavers). We explicitly looked for significant differences between these two categories of student but found none. This was surprising in the context of evidence that mature students in UK universities tend to favour deep rather than superficial learning more than do younger ones (Richardson 1994, 1995) and that older students tend to display better time management (Trueman and Hartley 1996) and have greater self-esteem and motivation (Murphy and Roopchand 2003) all of which are characteristics of autonomous learning. It is possible, given our relatively small sample size (thirty-three 18-20 year olds, seventeen 21 years old or older) that we have Type II errors; that we have falsely accepted the null hypothesis. However, reviewing a number of published studies that explore the relationship between student age and aspects of learner autonomy Derrick et al (2007) have demonstrated that no consensus has yet been reached in this area. It would appear therefore that more investigation of the relationship between autonomy and age is needed. Similarly our finding that gender and ALS score did not co-vary does not mean that practitioners and/or researchers can assume that gender is unimportant, rather it seems likely that the influence of gender on learner autonomy is variable and context specific (Derrick et al 2007).

We believe that it is likely that the two points of view held by the teachers are not mutually exclusive. Indeed the R^2 values for regression of A_S and A_SF1 against year of study were low to the extent that <10% of variation in perceived autonomy was explained by difference in

year of study. It does appear that autonomy increases (revealed through self –perception) during the years students spend at university; perhaps because of participation in their programme of study and perhaps also because of the general university ambience and to the natural maturation process. But it also sees likely that most of the variation in autonomy observed is attributable to variables other than year of study. We suspect that, for example, pre-university education, cultural background and societal influences as well as intrinsic differences in personality are liable to be important.

Based upon the quantitative results of our study, and accepting the limitations of our sample, we conclude that it is likely that there is development of learning autonomy as students complete their learning journey at university but that this is very much within the context of pre-existing diversity that is related to many personal and environmental/societal causes; a topic that is appropriate for further study in the area of biological sciences education and potentially in a wider context. Furthermore the ALS is a psychometric test that relies upon students' self-assessment. It has utility but the development of empirical approaches to assess student learning autonomy, utilizing external observers or measures of student, learning is a worthwhile goal. By applying the ALS to undergraduate biology students and obtaining similar results to those of Macaskill and Taylor (2010) we have demonstrated the applicability of the scale to a wider student constituency. This is significant because too often studies such as ours rely upon self generated and un-validated measurement tools (Dirks, 2011). Like Macaskill and Taylor we found that factor analysis revealed two combinations of ALS statements; *Independence of Learning* and *Study Habits* although we acknowledge that our factor structure does not completely align with theirs. This may be a consequence of our smaller sample size, but taken together with our observation that the mean A_s score we recorded from first year students was higher than that of both Macaskill and Taylor (2010) and Macaskill and Denovan (2011) it could also indicate a science discipline-related difference that is worthy of further study. We would recommend that any such study follow a multi-institution, longitudinal cohort comparison design to overcome the criticism of Dirks (2011) that too often in-practice pedagogical research in the area of bioscience education takes the form of single class case studies.

Acknowledgements

This research was supported by a Teaching Development Grant awarded by the Higher Education Academy UK Centre for Bioscience. We thank the teachers and students who gave their time.

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ALS statement		Factor		M&T structure
		1	2	
1	I plan my time for study effectively	0.74	0.13	Y
2	My time management is good	0.74	0.16	Y
3	I frequently find excuses for not getting down to work	0.70	0.05	Y
4	I am good at meeting deadlines	0.69	0.09	Y
5	I tend to be motivated to work by assessment deadlines	0.66	-0.09	N
6	I take responsibility for my learning experiences	0.64	0.29	N
7	Even when tasks are difficult I try to stick with them	0.39	0.48	Y
8	I am happy working on my own	0.34	-0.21	Y
9	I am open to new ways of doing familiar things	0.17	0.78	Y
10	I enjoy new learning experiences	0.13	0.71	Y
11	I enjoy being set a challenge	-0.11	0.84	Y
12	I enjoy finding information about new topics on my own	-0.01	0.75	Y

Table 1. PCA factor loadings (factor 1 and 2). Individual components are grouped according to the factor they are most closely associated with (indicated by shading). M&T structure relates to the level to which the factor structure agrees with those of Macaskill and Taylor (2010), the letter Y being used to indicate that group structure is in agreement and the letter N being used to indicate

that an individual ALS item is not part of the analogous Macaskill and Taylor grouping in the current study.

Autonomy Score	Year	Mean	N	s.d.	Anova	Tukey comparisons
A_s	0	43.5	22	5.4	$F_{80,3} = 2.9$, $p = 0.039$	2 > 0*; 1=2=3; 0=1=3
	1	46.3	27	5.3		
	2	48.4	14	5.4		
	3	47.3	21	5.4		
A_sF1	0	23.5	22	4.3	$F_{80,3} = 2.9$, $p = 0.036$	3>0*; 0=1=2; 1=2=3
	1	25.1	27	4.2		
	2	26.7	14	3.6		
	3	26.9	21	4.3		
A_sF2	0	20.1	22	2.8	$F_{82,1} = 1.4$, $p = 0.24$	0=1=2=3
	1	21.2	27	2.6		
	2	21.7	14	2.5		
	3	20.5	21	2.6		

Table 2. Comparisons of mean autonomy scores A_s, A_sF1 and A_sF2 recorded from pre-certificate (year 0), first (year 1), second (year 2) and third (year 3) students. * indicates statistically significantly Tukey pair wise comparisons (P = 0.05) (i.e. 2>0* indicates that the score for second year students is significantly higher than that of pre-certificate students while 1=2=3 indicates that the scores for first, second and third year students are not significantly different from one another).