

Nurturing Graduate Attributes through a First Year Student Experience Which Promotes the Formation of Effective Learning Communities

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Abstract Many students enter university with naïve epistemological beliefs and study approaches incompatible with the goals of higher education or the display of attributes such as critical or creative thinking. This study examines whether a first year experience can promote the formation of effective learning communities, which in turn can provide a mechanism for nurturing a range of graduate attributes. The curriculum encompasses initiatives to assimilate students into the university, prompts the adaptation of appropriate university study behaviour, and contains a general education component to broaden the student experience. The impact of the first year experience was examined by collecting quantitative data which measured students' perceptions of the effectiveness of assimilation, adaptation of study behaviour, the impact of the broadening component, and the nurturing of attributes. The data were analysed with structural equation modelling. A model in which the curriculum elements impacted on the development of graduate attributes showed a good fit to the data. Effective learning communities played a key role both in assimilation into the university community and the adoption of appropriate study behaviours.

Keywords: *first year experience, learning communities, graduate attributes, study behaviours, general education, structural equation modeling*

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1. Introduction

Governments have increasingly called for universities to produce graduates with a range of attributes now considered necessary for making a productive contribution to a knowledge-based economy. The study herein reported was conducted in Hong Kong. In its plan for system-wide education reform, the Hong Kong Government wants undergraduate degrees to be designed so as to cultivate a wide and diverse range of graduate attributes.

Reform of first degree courses to provide students with a wide range of learning experiences through which students' adaptiveness, creativity, language and interpersonal skills can be cultivated. Enriching campus life to broaden students' horizon and to cultivate commitment to the community [1].

The need for educational reforms stems in part from the Government's realization that the current system and curricula are not producing graduates with the attributes they will need if they are to contribute usefully to a knowledge-based society during their working lifetime. With the current pace of change in knowledge and society, graduate attributes have become even more important.

Society is undergoing fundamental changes. As it transforms from an industrial society into an information

society, and as our economy shifts its emphasis from manufacturing to knowledge-based activities, knowledge has become an essential element of our daily lives and our economy. The age of lifelong learning has dawned. However, our education system appears to have stagnated in the industrial age. Even in universities, students often have little experience outside their specialised areas of study. Many students stop learning after graduation, or are simply tired of learning even before graduation [2].

1.1. Problems with the Development of Graduate Attributes

The Hong Kong Government is far from the only one to suggest that graduate attributes have become increasingly important. Governments in Western European and North American countries, among others, have called for university graduates to be equipped with appropriate attributes [3,4]. Such reports have an implicit, and very often an explicit, recognition that universities do not appear to be doing as well as they might in producing graduates who have attained the targeted attributes [4,5].

Employers too have raised questions as to whether graduates have sufficiently developed the attributes needed for a knowledge-based economy. In the USA, a report calls for a need for American higher education to

rebuild American workplace competence, [6] and another report concluded that the main concern about the business sector was that the education system was not producing a suitable workforce to maintain the position of the USA as the leading economic power [7]. In Australia, a review of seven reports from Australian employers suggesting concerns that graduates were not equipped with the type of attributes needed for their professions [8]. Employers in the UK were also looking for soft skills in university graduates and rated disciplinary knowledge as being secondary [9].

Despite considerable attention to the issue, universities still seem unable to produce convincing evidence that they are able to guarantee that the bulk of their graduates will have acquired a broad range of attributes. There are many reports of isolated projects operating in individual departments or faculties [8,10]. Most of these target individual skills or a limited set of attributes [11,12,13]. The obvious limitation of such initiatives is that they are addressing only a small part of the picture. Moreover, Barrie [14] concluded that these small-scale projects have been prone to discontinuation because of a lack of support from management or colleagues, the funding running out, or the individuals concerned moving on to other things.

There is little in the literature to suggest that universities have been able to implement an effective strategy which affects all students and which addresses all attributes specified by the institution. A report reviewing initiatives in the UK concluded that their impact in addressing graduate attributes at the system-wide level had been remarkably unsuccessful, in spite of substantial amounts of funding being devoted to the issue. [15] A large-scale study on students and academic staff in a higher education institution in UK also found 'a gap between the needs of an industrially developed, or developing, society and the fostering by higher education institutions of important generic skills' (p. 366) [16]. Another report on a recent national initiative in Australia also suggested that the alignment of initiatives at different levels and the concerted efforts of different members of the university community were the biggest challenges for curriculum renewal. [17] Addressing this bigger picture seems likely to involve major curriculum initiatives and transformation by management, which are never easy to bring about.

1.2. First Year Experience Literature

Many students enter university with naïve epistemological beliefs and study approaches incompatible with the goals of higher education or the display of attributes such as critical or creative thinking. It would, therefore, seem logical that the first year curriculum should aim to start the process of assimilating new students into learning communities, and this will help them to develop more sophisticated epistemological beliefs and study behaviour more appropriate for university study, without which the nurturing of attributes is unlikely. It has been argued that personal epistemological beliefs relate closely to beliefs about learning, and so they thereby influence the chances of adapting to university during their first year of study [18].

It is, therefore, appropriate to examine the literature which goes under the banner of 'the first year experience' (FYE), as this deals with the assimilation of students into

university. The predominant original influence on the research into the FYE is probably that of Tinto's [19,20] work on student drop-out from US colleges. The FYE programs which followed were introduced to reduce drop-out, which was a major problem for US colleges, particularly in first year. They concentrated on social assimilation into college society. This means that the FYE literature must be refocused if it is to be appropriate for considering how the development of learning communities can be promoted, and that these in turn can play a part in developing graduate attributes.

1.3. Integration into Effective Learning Communities

If the process of assimilation in their first year succeeds, the students will be integrated into learning communities which Smith and Bath [12] defined as the 'social, interactive and collaborative character of the student experience of university life' (p. 275). To refocus the FYE literature, this can be envisaged as a two-phase process. The first phase is the social assimilation into one or more communities to a sufficient extent that they feel integrated into university society. The second phase considers the extent to which these communities promote effective learning outcomes and enable students to achieve academic congruence. There is, therefore, a need for students to become incorporated into broadly-based first-phase learning communities as well as second-phase learning communities appropriate to their discipline. There is likely to be some overlap and some commonality of membership between the types of community. It also has to be accepted that communities are likely to be dynamic in membership as students shift between courses. The characteristics of communities could also mutate as priorities shift when students progress through their degree. In our study the first phase appeared to be quickly accomplished by the large majority of students, but the second phase was a long and difficult process.

Social affiliation is a prerequisite for the formation of learning communities, but there is certainly no guarantee that assimilation will automatically result in effective learning communities. Indeed, social affiliation often results in less learning activity, as attention is diverted from academic tasks to social activities. The academic affiliation part of Tinto's model [19] corresponded with the normative congruence or value integration part of Durkheim's theory of suicide [21]. In academic terms integration occurs when students hold beliefs consistent with the demands of higher education and follow academic conventions in their work.

The nature of the collaboration and the type of communal learning activities engaged in was shown to affect the outcomes of the collaboration in previous qualitative research [22,23,24]. It was reported that collaborative activities could be placed on a spectrum from low to high task involvement [23]. In addition, the types of activities could be classified into engager or avoider approaches, which were parallel to the individual deep and surface learning approaches. Engager approaches were focused on collaboration to gain a better understanding of a concept, whereas avoider approaches were adopted to minimize the work of individuals in a group [24].

Previous studies also showed that the nature of the teaching and learning environment strongly influenced both the degree of collaborative learning and whether engager or avoider approaches were adopted [25,26]. Creating an appropriate teaching and learning environment promoted out-of-class relationships and encouraged the deployment of engager approaches, which resulted in students helping each other to understand key concepts and hence to achieve high-quality learning outcomes. The student experience, teaching and learning environment and curriculum design can, therefore, play an important role in developing effective learning communities.

1.5. the First Year Experience in Terms of Learning Communities

This section discusses the way to visualise the FYE, in terms of the discussion of learning communities, for the purpose of forming a structural model. The discussion of learning communities has visualised them as operating in two phases.

The first phase involves students being assimilated into social communities, so as to feel a sense of belonging to the university. The mechanism for this is well described in the FYE literature. Induction programmes aim to assimilate students into the university community. Teacher–student and student–student interactions are seen as important mechanisms for the assimilation process. The second phase goes beyond social assimilation, to turn the social communities into effective learning communities. For this to happen, an academic transformation underpinned by the

development of more sophisticated epistemological beliefs is required, which in itself is a prerequisite for the development of the study skills necessary for successful university study.

At the university in question, the first-phase social integration took place during orientation sessions which were similar in nature to those at most universities. Halls of residence and student societies were prominently involved in activities which were organised by students.

The second-phase academic transition was devolved to academic departments or disciplines, which is normally the case. Most included short formal induction activities. As discussed earlier, the process of helping students develop study approaches consistent with disciplinary demands is a significant transformation. Therefore, it was recognised that the second-phase transformation would have to be a gradual process. The extent to which the transition was explicitly addressed depended on the discipline and the nature of the pedagogy.

The model tested in this study also examined the impact of a broadening general education component, known as the common core. The reason for its inclusion in the model is that it was envisaged as having a transformative as well as a broadening role. The aims of the broadening component included a broadening of perspective, the development of intellectual skills, and the heightening of cultural and global awareness. Inclusion in the model would, therefore, serve as a test as to whether this part of the curriculum did indeed contribute to the development of more sophisticated study behaviours.

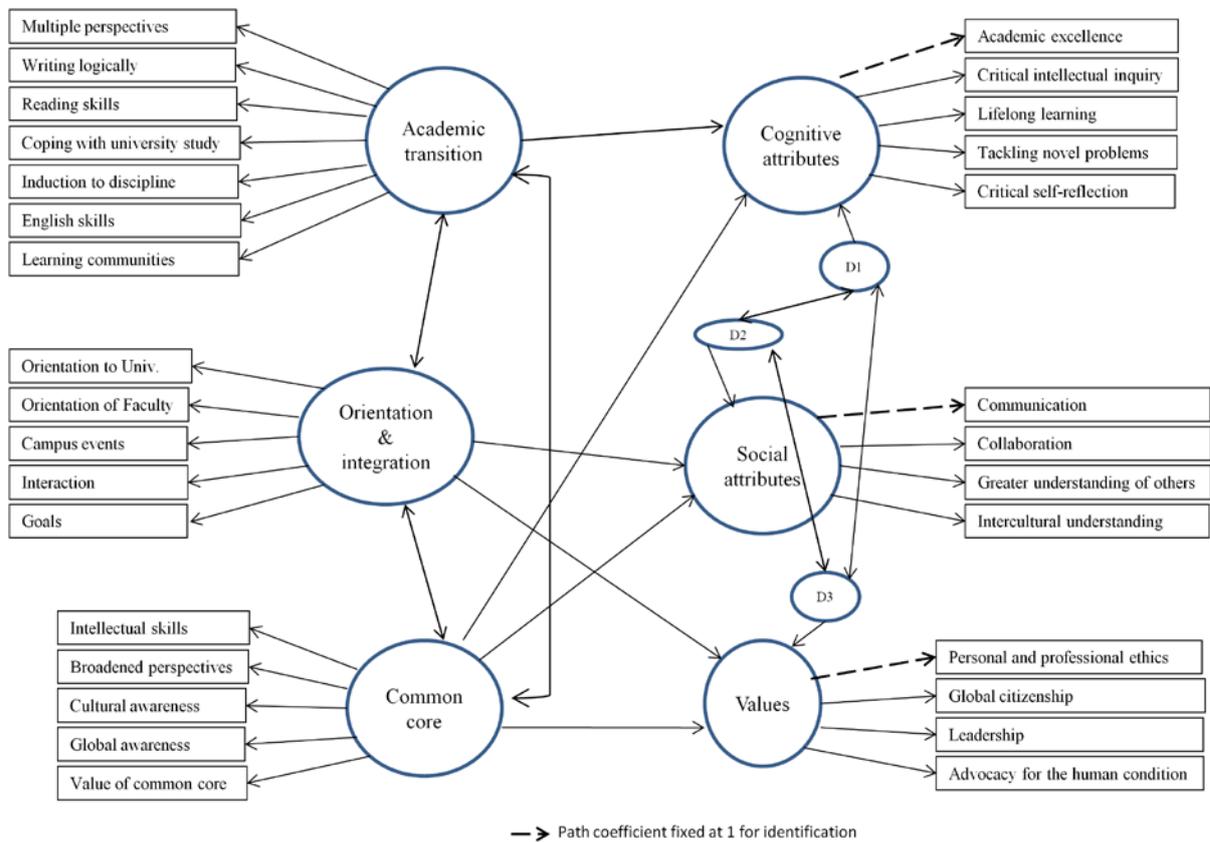


Figure 1. The hypothesized model relating the first year experience to development of graduate attributes

The aim of this study was to investigate whether elements of the first year student experience could impact on the development of graduate attributes. The specific four research questions are:

1. Would the mechanisms for student induction promote the formation of learning communities, which in turn would impact upon the nurturing of attributes?
2. Did students adapt their study behavior to forms more suited to university study?
3. Did the adapted study behaviors promote the development of attributes?
4. Did a broadening general education component of the curriculum nurture a wide range of targeted attributes?

These research questions were incorporated into an *a priori* structural model (Figure 1). The FYE was defined by three latent variables: *orientation and integration*, which characterizes induction into FYE; *academic transition*, which describes adapting study behaviors; and *common core*, which is a broadening general education component of the curriculum of the studied university. The five scales or indicators for the *orientation and integration* latent variable were derived from the FYE literature, as stated in the above literature review. The seven scales for the *academic transition* latent variable came from a project on adapting from school to university. [27] The five scales for the *common core* latent variable were taken from the stated goals of the curriculum element relating to the broadening general education component.

The hypothesized model includes three latent variables for these three curriculum elements: first-phase orientation; second-phase academic transition; and broadening general education. The structural model hypothesizes that these three elements of the FYE impact on the development of graduate attributes. The university, in which this study took place, has defined desirable graduate attributes as six university aims. Most of these aims contain two specific attributes, whereas one of them encompasses three. For measurement purposes and for incorporation into the model, the aims are, therefore, formulated as 13 attributes. These attributes can be divided into three categories following a scheme loosely based on Birenbaum's classification [28]. The three categories are represented by three latent variables in the model: *cognitive attributes* which consists of with five scales; *social attributes* of four scales; and *values* of four scales.

The hypothesized model follows a series of structural models which have featured a teaching and learning environment half impacting on the development of graduate attributes in the other half of the model [29-36]. The most recent versions feature the following latent variables in the teaching and learning environment part: teaching and curriculum; teacher-student interaction; and student-student interaction [32,37]. The graduate attributes are grouped under cognitive and social latent variables.

These models in previous studies have included final year students in the sample, so they have modeled a teaching and learning environment pertinent throughout an undergraduate degree. The model in this study concentrates on the FYE, so the left-hand half of the model differs from the previous ones by including variables pertinent to the FYE. The attributes side of the model contains a *values*

latent variable, in addition to the *cognitive* and *social* ones in previous models.

2. Materials and Methods

The research questions were addressed through a survey method. The survey instrument solicited students' perceptions of the effectiveness of assimilation, adaptation of study behaviour, the impact of the broadening component, and the nurturing of attributes. The intention was to use structural equation modelling to determine whether the aspects of the FYE in the study environment did have a significant relationship with the perceptions of the development of the desirable attributes in undergraduate students.

2.1. Sample and Procedure

Participants were full-time first year undergraduate students from all the undergraduate degree programmes offered by a comprehensive university in Hong Kong. The total population of first year undergraduate students was 3,117. In 2011, the students were asked to complete a questionnaire. The questionnaires were administered online just before the final examination in the second semester. A lucky draw with a prize of a laptop computer was held in July 2011 to boost the participation rate. A total of 2,019 students completed the questionnaires, thereby producing an overall response rate of 64.8%. This is comparable to a similar study among undergraduates in Hong Kong [30].

2.2. Instrument

The survey instrument was developed by a group of educational experts in higher education based on the literature on first year student experience and the special component, common core, to be incorporated into the curriculum, and with reference to a locally developed instrument, the Student Engagement Questionnaire, which measures the teaching and learning environment and students' learning outcomes at the programme level for university [33]. The current instrument comprises 66 items measuring the 30 scales of the six latent constructs of the hypothesized model. Twenty-three of the 30 scales have two items, five have three items, and one scale has four and the remaining scale has only one item. All items were measured on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Appendix 1 shows one sample item of each of the 30 scales in the instrument.

2.3. Data Analysis

Reliability of scales with at least two items was assessed by Cronbach's alpha, computed by SPSS18.0. Given that satisfactory reliabilities were obtained, mean scores for the scales were then computed by averaging their corresponding items and their covariance matrix was then submitted for further analysis.

Structural equation modeling (SEM) using EQS6.0 [38] was then performed to examine the impacts of the teaching and learning environment on the development of general attributes. Before the estimation of latent structure models, the normality of all 30 scales was investigated for

the sample, and the distributions of all observed variables were found to be within the level recommended for SEM with maximum likelihood estimation procedure (skewness < 2 and kurtosis < 7) [39]. Converged solutions with no out-of-range parameter estimates were obtained for all the analyses.

Assessment of model fit was based on multiple criteria including both absolute misfit and relative fit indices. The absolute misfit indices included the Root Mean Square Error of Approximation (RMSEA) [40] and the standardized

root mean squared residual (SRMR) [38]. The relative goodness-of-fit index computed in the study was the Comparative Fit Index (CFI) [41]. Values of RMSEA and SRMR < 0.08 are indicative of an acceptable fit. As a rule of thumb, values greater than 0.9 for CFI are considered as indicating an acceptable fit, [42] and values approaching 0.95 are indicative of a good fit [43]. Models with both SRMR and CFI or both SRMR and RMSEA values indicating an acceptable fit were not rejected.

Appendix 1. Sample items of the 30 scales in the instrument

Scale	Sample item
Academic transition	
Multiple perspectives	I have been encouraged to challenge conventional wisdom.
Writing logically	I have learnt how to construct a logical written argument.
Reading skills	I have learnt to identify important ideas in readings.
Coping with university study	I can prioritize between the demands of university life.
Induction to discipline	I have a good understanding of what my field of study (<i>e.g.</i> , Humanities, Science, Medicine, or Business) is about.
English skills	I have no difficulties making oral presentation in English.
Learning communities	I feel that I am a part of a group of students and teachers who are committed to learning.
Orientation & integration	
Orientation to University	Orientation activities provided a good introduction to academic life as a 'The University' student.
Orientation to Faculty	Orientation activities provided a good introduction to my Faculty.
Campus events	Taking part in campus events is intellectually stimulating.
Interaction	Interaction with my teachers is intellectually stimulating.
Goals	I have achieved my personal goals.
Common core	
Intellectual skills	The common core courses have enhanced my intellectual skills.
Broadened perspective	I have a critical understanding of the complexity and interconnectedness of issues in everyday life.
Cultural awareness	I am more aware of the interrelatedness of cultures.
Global awareness	I feel more inclined to play an active role as a responsible citizen.
Value of common core	The common core courses have helped to orient me to university study
Cognitive attributes	
Academic excellence	I have developed indepth knowledge in my areas of study.
Critical intellectual inquiry	I am able to look at things from different perspectives.
Lifelong learning	I have developed skills which will enable me to engage in lifelong learning.
Tackling novel problems	I feel confident about tackling unfamiliar problems.
Critical self-reflection	I have become more aware of my personal strengths and weaknesses.
Social attributes	
Communication	My skills in social communication have been improved.
Collaboration	I have learnt how to negotiate with others in coming to a decision.
Greater understanding of others	I am more able to see things from other people's point of view.
Intercultural understanding	I have developed some understanding of people of different cultural and ethnic backgrounds.
Values	
Personal and professional ethics	I have learnt to pursue ethical practices in social, academic and professional settings.
Global citizenship	I am aware of my role as a responsible global citizen.
Leadership	I have acquired leadership skills.
Advocacy for the human condition	My commitment of making the world a better place for all to live in has been enhanced.

Table 1. Cronbach's alpha values, mean scores and standard deviations of the scales in the study (N = 2019)

Construct	No. of items	Alpha	Mean (SD)
Academic transition			
Multiple perspectives	2	0.686	3.70 (0.70)
Writing logically	2	0.807	3.64 (0.70)
Reading skills	2	0.770	3.41 (0.78)
Coping with university study	2	0.786	3.39 (0.76)
Induction to discipline	2	0.695	3.59 (0.76)
English skills	4	0.905	3.78 (0.78)
Learning communities	3	0.790	3.61 (0.66)
Orientation & integration			
Orientation to University	3	0.743	3.61 (0.72)
Orientation to Faculty	1	---	3.48 (0.86)
Campus events	3	0.731	3.55 (0.65)
Interaction	2	0.615	3.82 (0.64)
Goals	2	0.727	3.17 (0.79)
Common core			
Intellectual skills	2	0.892	3.32 (0.96)
Broadened perspective	2	0.869	3.73 (0.76)
Cultural awareness	3	0.884	3.62 (0.73)
Global awareness	2	0.840	3.51 (0.77)
Value of common core	2	0.871	3.18 (1.03)
Cognitive attributes			
Academic excellence	2	0.662	3.58 (0.70)
Critical intellectual inquiry	2	0.779	3.72 (0.64)
Lifelong learning	2	0.798	3.58 (0.75)
Tackling novel problems	3	0.865	3.50 (0.69)
Critical self-reflection	2	0.792	3.73 (0.64)
Social attributes			
Communication	2	0.750	3.67 (0.67)
Collaboration	2	0.872	3.77 (0.65)
Greater understanding of others	2	0.850	3.81 (0.64)
Intercultural understanding	2	0.866	3.71 (0.68)
Values			
Personal and professional ethics	2	0.818	3.78 (0.64)
Global citizenship	2	0.855	3.56 (0.72)
Leadership	2	0.852	3.46 (0.82)
Advocacy for the human condition	2	0.807	3.64 (0.72)

3. Results

3.1. Reliability

The reliabilities of the 29 scales which have at least two items in the scale within the FYE and attributes domains in this sample were assessed by computing Cronbach alpha values; these are presented in Table 1. The remaining scale, Orientation to Faculty, under the latent variable orientation and integration, consists of only one item and the reliability measure does not apply in this situation. As shown in Table 1, most of the alpha values were higher than the common cut-off point of 0.7. The three exceptions were Induction to discipline, Interaction, and Academic excellence, but their alpha values were higher than 0.6 which is still acceptable as Schmitt [44] discussed the value of alpha values as low as 0.5 would not seriously attenuate validity. Hence, the scales used in this study were considered as reliable. Mean scores and standard deviations of the scales are also given in Table 1.

3.2. Testing Hypothesised Model

We used SEM to test the plausibility of the hypothesized model in Figure 1. The variances of the three latent variables, *academic transition*, *orientation and integration*, and *common core*, and a path for each of the three latent variables, *cognitive attributes*, *social attributes*, and *values*, to one of its items were fixed to 1 for identification of the model. The goodness-of-fit results of the model to the data were RMSEA = 0.08 (90% CI = 0.08, 0.09), SRMR = 0.07 and CFI = 0.82, which indicates an unacceptable fit to the observed data.

3.3. Modifications to Hypothesised Model

The EQS package has facilities for suggesting modifications to an *a priori* model to improve the fit to the data. The Wald test suggests paths which might be deleted and the multivariate LM test suggests paths which might be added to improve the fit. Good practice recommends that modifications are accepted only if they are theoretically plausible [45].

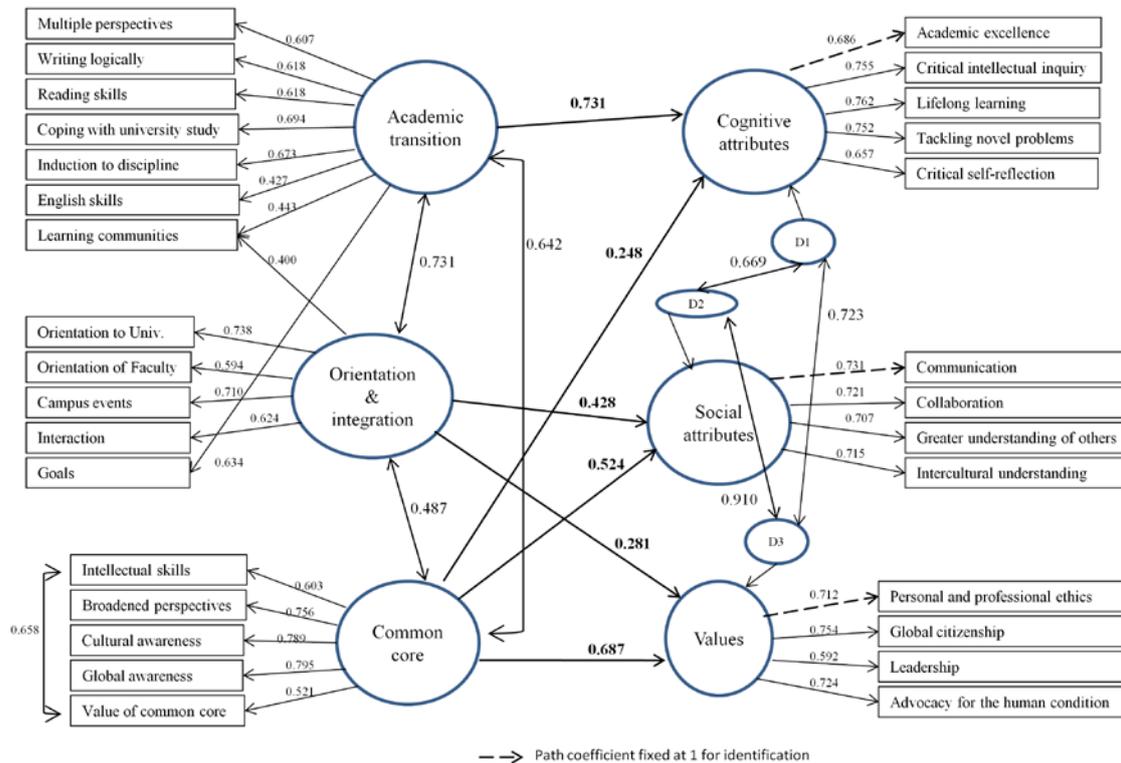


Figure 2. Standardized parameter estimates of the final model relating the first year experience to the development of graduate attributes

Following the work by Kemper and others, [29,30,33,36] we also used the multivariate LM tests and the Wald tests to make plausible modifications to the modeling of the latent variables and indicators in the two halves of the models in the study. Predicting all significant paths between the two model halves and the intercorrelations between latent variables can be less foreseeable. The *a priori* model, therefore, contained only those paths which we were fairly certain would feature in the final model.

Inspection of the results with multivariate LM tests showed that three paths would be statistically significant and they were: one from the *orientation and integration* latent variable to the learning communities indicator; one from the *academic transition* latent variable to the goals indicator; and a covariance path between two indicators, intellectual skills and values of common core, under the common core latent variable. The Wald tests, on the other hand, suggested that the path from the orientation and integration latent variable to the goals indicator was statistically non-significant. In view of the literature review refocusing the FYE literature towards the establishment of effective learning communities, it is particularly notable that an additional path was suggested from the *orientation and integration* latent variable to the learning communities indicator. The learning communities scale is then the only indicator to load on two latent variables; *academic transition*, and *orientation and integration* in the model. Hence, the model was respecified, with the three paths suggested by the multivariate LM tests added, and the path suggested by the Wald tests removed and resubmitted for analysis.

The fit indexes of the revised model indicated an acceptable fit to the data with RMSEA = 0.07 (90% CI = 0.06, 0.07), SRMR = 0.05 and CFI = 0.90. The standardized

parameter estimates of the revised model are shown in Figure 2. All the standardized factor loadings from the six latent variables to their indicators were greater than 0.4 and were statistically significant. The three latent variables in the FYE domains were positively correlated to a moderate extent. There were six positive and significant direct paths from the three latent variables in the FYE domain to the three attributes latent variables. The *academic transition* latent variable has a strong positive direct path to the *cognitive attributes*, the *orientation and integration* latent variable has a moderate path to the *social attributes* and a weak path to the *values* latent variable whereas the *common core* latent variable acted on all the three attributes latent variables, weakly on the *cognitive attributes* and moderately on the *social attributes* and the *values* latent variables.

4. Discussion

The findings of the present study provide evidence on the potential impacts of promoting social integration and academic transition as FYE through well-planned induction sessions and a discipline-specific academic transition program on adaption to university life in undergraduates. In particular, this study extends the FYE literature on the success of first-year assimilation from 'integration into learning community within the university' [12] to 'integration into a boarder community and culture' [27]. We discuss the impact of the elements of the FYE on the development of graduate attributes in the following.

4.1. Learning Communities

In the final model, the learning communities indicator was the only indicator to load on two latent variables; academic transition, and orientation and integration. This finding is consistent with the discussion in the section headed 'Integration into effective learning communities'. The first-phase social learning communities form through the orientation and integration programmes. It is consistent with the social integration that this part of the FYE impacts upon the development of social attributes. The second-phase learning communities are formed through the academic transition process and nurture cognitive attributes. This latter nurturing influence is a powerful one because the standardized coefficient (0.731) is the highest of those linking the left- and right-hand parts of the model.

4.2. Orientation and Integration

The indicators for the orientation and integration latent variable are consistent with an induction programme guided by the FYE literature. Through student–student and staff–student interaction and a programme of campus events, orientation and a sense of belonging develop to both university and faculty. The model is consistent with the notion of first-phase or social learning communities. There is a fairly strong path to the development of social attributes (standardised coefficient = 0.428), but no significant path to the development of cognitive attributes. Interestingly, there is also a significant path (standardised coefficient = 0.281) to the nurturing of values.

4.3. Academic Transition

The indicators for the academic transition latent variable were based on a qualitative study of the school-to-university transition. [27] This found that most students entered university having been accustomed to concentrate on striving to perform well in the examinations which ensure success in the elite Hong Kong education system.

The indicators for the academic transition latent variable show a set of five indicators with standardised coefficients above 0.6. These represent a set of interrelated transitions in study behaviour which students need in order to cope with university study and to become inducted into their discipline. As most students entered university with naïve epistemological beliefs, it was necessary for them to learn to recognise multiple perspectives. This appeared to be a co-requisite for developing the reading skills and the ability to write logically, which are necessary for successful university study. Learning communities loaded on the latent variable too. These can be interpreted as second-phase learning communities, which promote the adoption of study behaviours important for effective university study. Evidence for this interpretation is provided by the very strong link to the development of cognitive attributes (standardised coefficient = 0.731).

4.4. Broadening General Studies

The indicators for the broadening general studies component of the first year curriculum were formulated from the stated goals of the common core. These indicate that the curriculum design envisaged a transformative as well as a broadening function. It is, therefore, noteworthy

that there is a strong intercorrelation of the *common core* latent variable with the *academic transition* latent variable (coefficient = 0.642).

The findings of the present study also contribute evidence concerning the importance of incorporating a broadening general education component in the curriculum. The common core does appear to be contributing to the process of academic transition. Many of the courses on offer deal with topical subjects, which expose students to issues with multiple positions, or quite commonly controversial ones. Dealing with these issues is a step towards the process of adapting to university study described in the section above. It is notable that the common core contributes to the development of each of the three categories of attributes. There is a particularly strong impact on values (standardised coefficient = 0.687) and social attributes (standardised coefficient = 0.524). The nurturing of values conceivably occurs through the discussion of sensitive issues, which would also contribute to the development of social attributes like communication and collaboration.

4.5. Values

Previous models of the development of graduate attributes, which we have tested, have been confined to cognitive and social attributes. This has been the first model which has included the affective or values category of attributes. A qualitative study of mechanisms for the development of graduate attributes found limited mechanisms for the development of affective attributes (unpublished data).

4.6. Development of Graduate Attributes

The introduction suggested that universities have found it difficult to produce graduates with the level of attributes desired by governments and industry. One suggested reason for this inability is that there is a lack of clear models for how these attributes might be nurtured. This study is, therefore, of significance in that it points clearly to mechanisms for the three main categories of graduate attributes. What is more, the magnitude of the standardised coefficients indicates that these can be very effective mechanisms.

The study has indicated the potential mechanisms for nurturing three categories of graduate attributes. However, there are two conditions required for the mechanism to actually operate. Firstly, the first year student learning environment and the courses within it have to be configured in a way which is consistent with the elements of the model. Secondly, students have to participate actively in the learning communities in the manner described in this article.

High fit indicators will be found if elements of the model hypothesised as linked show high correlations. These will be high if linked indicators on the left and right are both rated highly. However, there will also be a high correlation if both indicators are rated lowly. The model will, therefore, show a good fit to the data for courses configured in a manner conducive to nurturing attributes, which courses do indeed develop such attributes. It will also show a good fit to the data in courses not compatible with nurturing attributes, which have a poor record in attribute development. The same considerations operate at

the within-course or individual student level. A student who takes full advantage of an aspect of the student experience will rate it highly and should also perceive the development of an appropriate attribute. However, those who, for some reason, fail to take advantage of the mechanism offered by a learning community will give low ratings to relevant indicators and should not perceive high levels of development of connected attributes.

5. Conclusions

It is no longer considered sufficient for an undergraduate degree to consist of an indepth study of a single discipline. Universities are now expected to produce graduates who have experienced a broad all-round education and, most importantly, have developed a range of graduate attributes, including ones in cognitive, social and affective categories. Nurturing these attributes seems to require a more broadly-based curriculum with a rich student experience, particularly in their first year.

This study has produced evidence of the role of learning communities in nurturing graduate attributes. For this to happen, student communities need to move beyond the phase of social accommodation characterised in the FYE literature, towards a second phase in which they function as transformative learning communities.

In the final structural model, the learning community indicator had a significant impact on factors for both the first year assimilation and the adaptation of study behaviour. The magnitude of the standardised coefficients in the tested model indicates that the effects were strong. These factors were in turn a powerful influence on the development of graduate attributes. These results highlight the importance of the FYE moving beyond a first phase of social assimilation, towards a second phase which concentrates on refocussing study beliefs and behaviour. However, data in the present study were gathered from a comprehensive university in Hong Kong, and the applicability of the findings to other campus settings is unknown. In addition, the incentive of a laptop to boost participation in the study might have also introduced bias to the findings in the way that students might be tended to rate more positively on the items caused by extrinsic motivation initiated by the incentive. More studies, therefore, are needed to further test the extended first year curriculum in higher education settings other than in Hong Kong and to investigate the impact of a social integration and academic transition programme on graduate attribute development.

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