Studies in Continuing Education

ISSN: 0158-037X (Print) 1470-126X (Online) Journal homepage: https://www.tandfonline.com/loi/csce20

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To cite this article: Yaw Owusu-Agyeman & Magda Fourie-Malherbe (2019) Negotiating co-ownership of learning in higher education: an underexplored practice for adult learning, Studies in Continuing Education, 41:1, 17-35, DOI: 10.1080/0158037X.2018.1497591

To link to this article: https://doi.org/10.1080/0158037X.2018.1497591

Published online: 11 Jul 2018.

STUDIES IN CONTINUING EDUCATION
2019, VOL. 41, NO. 1, 17–35
https://doi.org/10.1080/0158037X.2018.1497591

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Taylor & Francis Group

Negotiating co-ownership of learning in higher education: an underexplored practice for adult learning

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ABSTRACT

Adults who enrol in higher education institutions (HEIs) often have contributions that could serve in enhancing the planning and implementation of their programmes. Importantly, while terms such as active learner engagement and knowledge co-creation dominate adult learning discussions, there are unanswered questions pertaining to how adult learners negotiate co-ownership of their learning. The current empirical study explores the relevant factors that could enhance adult learners' involvement in negotiating co-ownership of learning in a higher education setting. A mixed method of gathering and analysing data from adult learners ($n = 200$) was followed. While structural equation modelling (SEM) served as the quantitative data analysis method, codes, categories and themes developed from the focus group discussions and interviews were used to analyse the qualitative data. The study revealed that negotiating co-ownership of learning among adult learners in HEIs is influenced by the level of engagement and adult learners' acquisition of relevant core knowledge and skills. The authors discuss the implications of the results by reflecting on the pluses of negotiating co-ownership of learning at the institutional and classroom levels while also showing how the lack of these provisions could hinder effective learning among adult learners.

ARTICLE HISTORY
Received 10 August 2017
Accepted 3 July 2018

KEYWORDS
Negotiation; co-ownership; adult learning; engagement; higher education

Introduction

Participation of learners in the planning and implementation of educational programmes has in recent years received increased attention. Evidence from Australia (Brew and Barrie 1999), Sweden (Bergmark and Westman 2016), the USA (Kasworm 2010; McAdoo and Manwaring 2009) and Ireland (Enright and O'Sullivan 2010) shows that negotiation of, for example, the curriculum has been embraced in many countries at various levels of the education system. Negotiation of curriculum by learners with lecturers and other stakeholders on key learning objectives and the curriculum content represent a facet of Dewey's idea of education and democracy (Hopkins 2014) which is essential for promoting teaching and learning. Markedly, Dewey's philosophy of education consisted of an amalgam of curriculum structures, collaborative learning and personal growth (Hopkins

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2014) as well as education and experience (Kohli 2018). Other concepts such as collaboration and partnership (see Dunne and Zandstra 2011; Healey, Flint, and Harrington 2016) explicate how adult learners could identify themselves as essential actors in the teaching and learning processes and also negotiate co-ownership of their learning.

The need for learners to take responsibility for the educational process (Bovill et al. 2016) as well as the continuous exploration of ways of improving curriculum and pedagogy sets the background for discussing how adult learners could negotiate co-ownership of learning. Negotiation of co-ownership in the context of this study describes the educational democratic practice that incorporates the input of adult learners in the teaching and learning processes, thereby, providing them with a sense of ownership. The authors define adult learners as students who did not enrol in university after high school, but pursued other forms of training and entered higher education degree programmes as mature students based on their age, work experiences, prior entry qualifications and passing entrance examinations. Premised on the constructivist approach to teaching and learning (see Cook-Sather 2014), this study draws on the views and experiences of adult learners who were pursuing engineering programmes in three universities in Ghana. Through the views and experiences of adult learners, we discuss the extent to which adult learners negotiate co-ownership of their learning in an engineering environment.

Context of the study and rationale

Higher education in Ghana has witnessed an enormous expansion over the last three decades with both public and private institutions playing important roles in the development of the knowledge and skills of learners and the economy. With a current gross enrolment ratio (GER) of 16.07% (UNESCO 2018) and a rise in the enrolment figures of adult learners especially in private universities from 3123 in 2009 to 9938 in 2016 (National Council on Tertiary Education 1998), a lot more adults are likely to seek higher education qualifications. Several factors however account for the increasing enrolment rate of adult learners in higher education institutions (HEIs) in Ghana. These include industry-driven demand factors; changing students' demographics coupled with the complexities in the knowledge and skills demands of modern labour force (see Owusu-Agyeman, Fourie-Malherbe, and Frick 2018). Furthermore, automation of work processes which comes along with high technical knowledge and skills expectations remain a major contributing factor to the rising enrolment rate of adult learners in HEIs. While global work transitions are estimated at between 75 million to 375 million (representing 3–14%) of the global workforce by the year 2030, a corollary is that, lot more workers are shall seek further training in HEIs in order to remain employed (McKinsey Global Institute 2017).

In order to address the questions arising from negotiation of co-ownership (NOC) by adult learners, we discuss four factors that are relevant in promoting adult learning programmes in HEIs; motivation (MOT), adult learners' engagement (ALE), core engineering knowledge and skills (CEK), and programme relevance to the needs of adult learners (PRA). Following the four factors identified as necessary for promoting negotiation of co-ownership by adult learners, we seek answers to two critical questions. The first question is: what factors are necessary to enhance negotiation of co-ownership among adult learners in HEIs? and the second question, how does the negotiation of co-ownership

enhance adult learners' knowledge and skills in higher education? Theoretically, the authors posit that negotiation of co-ownership of learning in principle does not erode the responsibilities of the facilitator – contrary to the views of behaviourists (see Light and Cox 2001) – but rather, serves to strengthen adult learners' engagement. We use the term 'programme' rather than 'curriculum' in this study because we identify the term programme to include: programme content, teaching and learning processes, composition of project and assignment groups, practical matters such as seating arrangements, and building the academic environment to achieve individual and institutional goals. Next, we discuss the theoretical underpinning of negotiation of co-ownership in HEIs. The empirical findings are presented in the discussion section of this article.

Theoretical review

Consistent with constructivism (Fry, Ketteridge, and Marshall 2009), we argue that adult learners develop their knowledge and skills by constructing meaning of the theory and practical work they undertake in class, in laboratories and in the field. Adult learners understand their environment through the formulation of ideas that arise out of interaction, experiences and reflection (Cook-Sather 2014; Fry, Ketteridge, and Marshall 2009). However, while proponents of constructivism advocate the importance of negotiation in the teaching and learning processes, behaviourists (Light and Cox 2001) suggest that negotiation rather interferes with the core functions of the facilitator. Key to the views of behaviourists on the development of the knowledge and skills of learners are the concepts of conditioning and reinforcement (Saylor 2015) that reifies the responsibilities of facilitators to include ensuring that learning takes place through activities that stimulate learning among adults.

In espousing the importance of constructivism in adult learning, several authors (Bunce, Baird, and Jones 2017; Jensen and Bennett 2016; Schaap, van der Schaaf, and de Bruijn 2017) suggest that negotiation of co-ownership promotes learner participation and their contribution to the development and implementation of adult learning programmes. By re-organising the teaching, learning and assessment processes through learners' involvement, in other words, their co-ownership (Bunce, Baird, and Jones 2017; Cook-Sather 2014; Fry, Ketteridge, and Marshall 2009; Jensen and Bennett 2016; Kahu 2013), facilitators contribute to enhancing the knowledge and skills proficiency of the adult learners. Cooperstein and Kocevar-Weidinger (2004), however, opine that learners can actively participate in the planning and implementation of classroom activities only when they have the opportunity to do so. Such participation can be promoted or obstructed by a variety of factors, including institutional climate, culture, mission, vision, ethos and policies (Fry, Ketteridge, and Marshall 2009; Jafar 2016; McCombs and Vakili 2005; Stefani 2009) of HEIs. Our study, however, focused on how the four factors of motivation, engagement, core knowledge and skills, and programme relevance could serve to enhance negotiation of co-ownership of adult learners' learning in HEIs.

The conceptual model

The concept of *negotiation* have been advocated by several scholars (see Cook 1992; Kasworm 2010; McCombs and Vakili 2005; Schaap, van der Schaaf, and de Bruijn

2017; Thorkildsen 2002) to describe consultation between facilitators and students about aims, objectives, course content, teaching/learning methods, resources, and assessment processes. Focusing on the centrality of learning, Enghag and Niedderer (2008) suggest that the ownership concept describes the actions and control of specific learning processes, execution of the learning process and the reporting of the process that are undertaken by individuals or groups. Additionally, shared experiences and interactions help address professional knowledge and skills needs (see Bunce, Baird, and Jones 2017; Kahu 2013; Schaap, van der Schaaf, and de Bruijn 2017) while feedback is readily available for learners to evaluate their performance. The authors posit that negotiation could take place at two levels: firstly, at the institutional level where adult learners could negotiate for learning resources such as internet connectivity, books in the library, modern laboratories and equipment for practical work. The second level of negotiation occurs between the facilitator and adult learners and is directly associated with the teaching and learning processes.

Adult learners' engagement in learning emanates from a plethora of factors: communication between effort, time and resources (Bryson 2016; Kahu 2013; Trowler 2010); active collaboration amongst and between learners and facilitators (Bunce, Baird, and Jones 2017; Dunne and Zandstra 2011; Healey, Flint, and Harrington 2016; Neary 2012) and the co-creation of curriculum between facilitators and learners (Bergmark and Westman 2016; Jafar 2016; Nelken 2009; Taylor and Bovill 2018). Through effective engagement, the knowledge and skills of learners are enhanced by way of interaction between the content and incentive dimensions (see Andresen, Boud, and Cohen 2000; Illeris 2009) as well as their experiences. Neary et al. (2014) observed that learners' engagement could include activities such as students working with staff to develop and design curriculum; staff recruitment and programme approval and collaborating around the production of research. Inversely, from a behavioural perspective, conditioning is necessary in developing the knowledge and skills of adult learners, because knowledge acquisition generates from individual responses to stimuli in the environment (Fasokun, Katahoire, and Oduaran 2005, 53; Saylor 2015). Proponents of the behavioural perspective argue that student engagement results from institutional practices, student achievement and satisfaction, teaching practices, time on task as well as social and academic integration (Kahu 2013). Although engagement is necessary for the development of the knowledge and skills of adult learners, Zepke (2014) suggests that it is imperative for researchers to take cognisance of institutional culture that also identifies diversity. Beyond the theoretical contestations is the fact that adult learners' engagement should include listening to their voice, providing them with channels to communicate their knowledge and skills expectations and giving rich campus experience.

The *relevance of adult learning programmes* is dependent on the knowledge and skills needs of learners. Formal adult learning settings all over the world have altered the traditional mode of teaching and learning where education providers and facilitators controlled the teaching and learning process without incorporating the views of students (Bergmark and Westman 2016). The learner-centred approach to teaching and learning which has replaced the hitherto teacher-centred approach now incorporates the views of learners and also provide them the opportunity to negotiate co-ownership of their programmes. This implies that the adult learning setting will not depend solely on the input or expressed opinion of only the facilitator, but will also take account of the views of adult

learners (Brew and Barrie 1999; Cercone 2008; Kasworm 2003; Stewart 2013) which includes their knowledge and skills expectations. For instance, during teaching and learning process, adult learners are able to reflect on existing theory and how it relates to actual work requirements and identify how gaps or shortcomings could be addressed using the knowledge acquired. Therefore, the relevance of adult learning programmes requires critical reflection where adult learners measure their intended goals against the knowledge and skills they receive in class. Reflection involves the process of re-thinking and reshaping of ideas based on new knowledge (Bell and Mladenovic 2013; Romiszowski 2016; Stewart 2013). Hill (2014, 64) posits that learning among adults is more effective when they include critical self-reflection and the application of experiences in the learning process.

Motivation is a prerequisite for effective programme planning and implementation because it directs adult learners' to goal-oriented efforts (Kasworm 2010; Martin 2012; Stewart 2013) which will enhance knowledge and skills acquisition in the teaching and learning process (Rothes, Lemos, and Gonçalves 2017; Thorkildsen 2002). Several authors (see Enghag and Niedderer 2008; Rainer and Matthews 2002) have explicated the impact of motivation on the ownership concept. Martin (2012) posits that motivation is an important process that directs the behaviour and intellect of individuals and supports their actions and behaviours as expressed at different life stages and time. Jarvis (2004) also maintains that the concept of motivation in adult learning is important for understanding of the characteristics of the adult learner (attitudes, needs, stimulation, emotion, competence and reinforcement), and it is crucial for education providers to understand the motivation of adult learners when developing their curriculum. However, from a postmodern perspective, Biesta (2006) argues that the agenda for learning among adults is often determined by others rather than the learner therefore reducing the individualisation of the adult to drive his goal towards learning. While different explanation has been given to the concept of motivation, it is described as both intrinsic and extrinsic drivers of students' desire to acquire knowledge and skills leading to education qualifications (Rothes, Lemos, and Gonçalves 2017; Snyman and van den Berg 2018). Extrinsic motivation serves as an innate urge for adult learners to obtain higher education credentials and rise on the professional ladder whereas intrinsic motivation drives adult learners to develop their knowledge, skills and attitude in order to improve themselves. Importantly, adult learners often re-adjust to fit into their new learning environment that also allows them to direct their learning towards achieving their goals through motivation.

The core engineering knowledge and skills of adult learners are essential to the concept of negotiation of co-ownership because they define the knowledge and skills expectations of these learners during the teaching and learning processes. Engineering education has evolved to include the application of structured knowledge to explicate practical issues that comes out of professional work processes (Huff, Zoltowski, and Oakes 2016; Land, 2013). Emerging work processes require engineering professionals to be ingenious and apply theoretical knowledge, practical skills and advanced technology to solving problems in the workplace (Crawley et al. 2014; Romiszowski 2016). Core engineering knowledge therefore includes theoretical knowledge that underpins engineering practice and content knowledge. An example of a concept that enhances practical knowledge is mechanical dissection (Land 2013) which is used for forensic diagnosis, analysis and prescribing solutions to engineering problems. Core engineering knowledge and skills have become necessary due to the complexities of the 'learning for earning' (Biesta 2006) market that

draws on the expectations of employers as well. Even though HEIs have specific policies that govern academic activities, their obligation to engage adult learners through the negotiation of their learning, in other words, promoting co-ownership, needs to be enhanced and institutionalised.

Research questions and hypothesis

Drawing upon the work of various scholars (Boud 1992; Jensen and Bennett 2016; Kasworm 2010; McCombs and Vakili 2005) who have advanced arguments for negotiation of co-ownership in HE, we present empirical evidence from three universities in Ghana. The overarching research questions for this study are (i) what factors are necessary for enhancing negotiation of co-ownership among adult learners in HEIs and (ii) how does negotiation of co-ownership enhance adult learners' knowledge and skills in higher education? In order to investigate the impact of negotiation of co-ownership on adult learners in HEIs and to explore the relationship between the different factors in the study, the following research hypothesis were developed for the study;

H_{1a}: There is a statistically significant positive relationship between adult learners' engagement and negotiation of co-ownership.

H_{1b}: There is a statistically significant positive relationship between the relevance of adult learning programmes and negotiation of co-ownership.

H_{1c}: Adult learners' motivation to acquire further knowledge is influenced by negotiation of co-ownership in higher education.

H_{1d}: Adult learners' core engineering knowledge and skills are positively enhanced by negotiation of co-ownership.

H_{2a}: There is a statistically significant positive relationship between adult learners' engagement and core engineering knowledge and relevant skills.

H_{2a}: Adult learners' core engineering knowledge and skills are positively influenced by adult learners' motivation to acquire further knowledge.

Methods

Framed along a pragmatist philosophy and a mixed method design (Cohen, Manion, and Morrison 2011; Creswell 2013; Seidman 2013), the authors concurrently gathered and analysed data from adult learners from three different HEIs. The pragmatist philosophy was adopted for this study mainly because the authors considered the transformation of the link between the concept of negotiation of co-ownership and practice as essential to understanding how adult learners develop their knowledge and skills. The mixed method design was subsequently followed to draw on the strengths of both quantitative and qualitative data sources and analysis in investigating negotiated co-ownership practices among adult learners in three HEIs in Ghana. Previous studies by Owusu-Agyeman and others (2018) in the same context showed that the use of mixed methods in gathering and analysing data from adult learners could provide deeper insight in the teaching and learning processes. The rationale for selecting three diverse universities

was to gather and analyse relevant data from the different types of institutions with unique structures and operations (Clayson and Haley 2005; Olssen and Peters 2005) that could reveal the extent to which adult learners' could negotiate co-ownership of their programmes.

Participants and setting

The population of the study was 49,148 students in three universities in Ghana with the breakdown as follows; one public university (42,590 students), one regional university (1550 students) and one private university (5008 students) in Ghana. We followed a simple random sampling method for selecting participants for the survey and a purposive sampling method for selecting participants for the focus group discussions and interviews. Importantly, 97% of our sample were workers in different engineering and allied organisations and their average age was 32 years. The sample size for the study was 343 adult learners with the breakdown as follows: Public University (PUB) – 188; Private University (PRU) – 84; Specialist (regional) University (SPU) – 71. The authors contacted 240 potential respondents in the three universities to provide their responses to questions and discussion items.

Procedure

The researchers administered 240 questionnaires to respondents from the three universities. From the 240 questionnaires issued, we received 213 completed questionnaires of which 200, representing 83.33%, were valid responses. The number of male respondents was 182 representing 91%, while female respondents were 18 representing 9% completed the questionnaires. Twenty-seven adult learners made up of three groups from each university participated in the focus group discussions and the same procedure for gathering information from the participants was repeated in all the discussions held among the different groups. The authors ensured that in conducting the focus group discussions and the interview sessions, construct and internal validity were strengthened through the development of interview schedules that were open, and to some extent non-prejudicial and devoid of bias (Cohen, Manion, and Morrison 2011; Creswell 2013; Seidman 2013). Importantly, the focus group participants were allowed to freely state their opinions on the various items discussed and they were not provided with suggestions by the interviewer.

Prior to administering the interview schedules and questionnaires, we undertook a pretest to ensure that respondents and focus group participants understood the questionnaires and that, the discussion items were devoid of ambiguity. This measure strengthened the reliability of the datasets. Detailed discussion of the reliability of the survey datasets is given in the results section of this study. We adopted triangulation (Nieuwenhuis 2012) to strengthen the trustworthiness of our research. This was done by checking the extent to which the study findings were based on the focus group discussions and survey and comparing the results to each of the sources. In line with the rules of ethical consideration, the researchers obtained written permission from management of the three universities before administering the questionnaires and conducting the focus group discussions. The focus group participants and survey respondents were contacted by the researchers prior to

collecting data from them while the date for the discussions was also agreed with the participants. The contact details of the participants were obtained from the institution mostly through the class representatives. All respondents and interviewees were given consent forms to sign, indicating their willingness to provide information for the study. Additionally, care was taken by the researchers to ensure the confidentiality of the information provided by respondents, as well as the safe storage of the datasets gathered.

Instruments

The focus group discussion schedule consisted of three main items. The first item sought to glean from respondents their view on how their programme structure allowed for active participation and negotiation of the learning process. The second item sought to investigate adult learners' engagement in the teaching and learning processes. Negotiation of co-ownership at the institutional level was the last item for discussion and this item sought identify the institutional factors that could contribute to adult learners' negotiation of co-ownership. The qualitative data that we gathered were analysed using qualitative processes namely content analysis, pre-coding, coding, categorising codes and the development of themes that connected with the theories we used in the study.

Regarding the quantitative data, negotiation of co-ownership measured 30 items spread in six main sections: section A covered the demographic information; section B elicited information on adult learners' engagement; section C, on core engineering knowledge and relevant skills; section D, programme relevance to the needs of adult learners; section E, negotiation of co-ownership and lastly, section F contained information on adult learners' motivation to pursue higher education. The survey items in sections B to F were developed on a 5-point Likert scale, where 5 represented 'strongly agree' while 1 represented 'strongly disagree'.

The authors followed a series of principal component analyses (PCA) to test the distinctiveness of the variables (ALE, PRA, CEK, NOC and MOT) that underlie adult learners' negotiation of co-ownership using SPSS v21. Additionally, we used factor analysis purposely as a dimension reduction method of multi-variate statistics to analyse the latent variables from manifest variables (see Cohen, Manion, and Morrison 2011; Tzeng, Chiang, and Li 2007) in the study. The following steps served as guide for the factor analysis:

Step 1: Computing the correlation matrix ($\boldsymbol{R}$) of the five variables used for the study.

Step 2: Computing the eigenvalues ($\lambda_k, k = 1, 2, 3 \ldots m$) and eigenvectors ($\beta_k = \beta_{1k.} \ldots . \beta_{1k,} \ldots, \beta_k$) for measuring the number of factors (m) and factor loadings ($a_{ik} = \sqrt{\lambda_k \beta_{ik}}$) for the study.

Step 3: Deciding on the eigenvalue ordering ($\lambda_1 > \ldots \lambda_k > \ldots > \lambda_m; \lambda_m > 1$), the number of common factors to use and the extraction of common factors based on the concepts of negotiation and ownership.

Step 4: Selecting the varimax rotation criteria for determining the rotated factor-loading matrix.

Step 5: Providing names for the various factors selected based on the theoretical structure and the manifest variables used for the study (see Tzeng, Chiang, and Li 2007).

Following the principal component analysis, we computed the absolute fit indices to examine the extent to which the 5-factor priori model fit the data from the sample used while exhibiting the model with the most superior fit (see McDonald and Ho 2002).

Notably, the chi-square, the goodness of fit index (GFI), the comparative fit index (CFI), the non-normed fit index (NNFI) and the root mean square error of approximation (RMSEA) were computed.

Results

Analysis of the quantitative data

The authors first carried out the reliability test by way of Cronbach's alpha (α) in order to ascertain the internal consistencies of the measurement constructs. Additionally, we computed composite reliability and compared the values to the recommended threshold of 0.70 (see Hair et al. 2014). All the measurement constructs showed acceptable internal consistencies (αALE = 0.85, αPRA = 0.79, αCEK = 0.77, αNOC = 0.77 *and* αMOT = 0.89) as presented in Table 1. Furthermore, all Cronbach's alpha coefficients and composite reliability indicators were above the 0.7 stipulated threshold (CR => 0.81, α => 0.77). Hair et al. (2014) posit that constructs that demonstrate composite reliability figures equal or greater than 0.70 denote satisfactory reliability. The square roots of the average variance extracted (AVEs) were also computed (see Table 1) for the confirmation of discriminant validity which is required to be above the correlations between the constructs (see Fornell and Larcker 1981; Hair et al. 2014).

Table 1 provides detailed information on the mean scores and the standard deviation where MOT ($M = 4.45$, SD = 0.42) demonstrated high mean values while the lowest mean values were revealed in NOC ($M = 3.94$, SD = 0.73). Importantly, we provide information on the strength of association between the five variables (see Table 1).

As shown in Table 1, a statistically significant relationship was observed between NOC and CEK ($r = 0.71$, $p < .01$). Adult learners who indicated strong satisfaction with the negotiation of co-ownership process also considered the core engineering knowledge and skills as important in the learning process. This explains 50.4% ($R^2 = 0.54$) of the variance. The study also showed a significant relationship between PRA and ALE ($r = 0.49$, $p < .01$), PRA and CEK ($r = 0.55$, $p < .01$) and PRA and MOT ($r = 0.54$, $p < .01$). What this means is that, programme relevance is important to the following: the co-creation of knowledge, core engineering knowledge and skills and the motivation of adult learners to negotiate co-ownership of their learning. Invariably, the data revealed that 24% ($R^2 = 0.24$) of the variance in adult learners' negotiation of co-ownership of their learning could be explained by the relevance of the programmes. Similarly, 30.2% ($R^2 = 0.30$) and 29.2% ($R^2 = 0.29$) of the variance in adult learners' negotiation and ownership of their programmes could be explained by core engineering knowledge and skills and

Table 1. Correlation matrix with CA, AVE and CR.

	CA (α)	AVE	CR	MEAN	STDEV	ALE	PRA	CEK	NOC	MOT
ALE	0.855	0.619	0.847	4.343	0.506	**0.787**				
PRA	0.791	0.589	0.825	4.307	0.509	0.489	**0.767**			
CEK	0.765	0.527	0.809	4.127	0.526	0.573	0.552	**0.726**		
NOC	0.772	0.568	0.816	3.943	0.726	0.579	0.443	0.714	**0.754**	
MOT	0.887	0.622	0.892	4.449	0.422	0.519	0.540	0.546	0.511	**0.789**

Note: Correlations are significant at the $p < .01$ level. The square roots of the AVEs are displayed on the diagonal in bold fonts. CA: Cronbach's alpha; AVE: average variance extracted; CR: composite reliability; STDEV: standard deviation.

adult learners' motivation to acquire higher education qualifications respectively. The other variables (PRA, MOT, ALE, CEK and NOC) all revealed positive statistically significant relationships as shown in Table 1.

The next step we adopted was to test for the suitability of the data for factorisation by way of the Bartlett test of sphericity and the Kaiser–Mayer–Olkin measure of sampling adequacy (Williams, Onsman, and Brown 2010). While the Bartlett test of sphericity measured the correlations between variables, the Kaiser–Mayer–Olkin measure of sampling adequacy sought to correlate the pairs of variables which also required variables to be statistically significant with an overall measure of 0.6 or higher (see Cohen, Manion, and Morrison 2011). The Kaiser–Mayer–Olkin measure of sampling adequacy with a value of 0.831 and the Bartlett's Test of Sphericity of ($x^2 = 2051.614$, d. f. $= 300$, significance $= 0.000$) suggest that the correlations between the five variables are explained by various variables in the dataset. Seeing that the data was suitable for factorisation, the researchers proceeded to extract the factors.

Factor extraction and rotation

Principal component analysis with varimax rotation and Kaiser Normalisation was adopted in order to obtain theoretically analogous and significant factors underlying adult learners' negotiation of programmes and the ownership of their learning processes. The researchers ensured that eigenvalues equal to or greater than 1.00 served as the basis for determining the number of factors to use for the analysis. Importantly, the 25 items used in the orthogonal rotation produced five factors that accounted for 17.95%, 13.0%, 9.39%, 7.80% and 7.34% of the total variance explained.

As shown in Table 2, the rotated component matrix is categorised into the descriptors, items and components or factors. In order to provide a coherent explanation for the factors extracted, only factors with values above 0.5 were selected for the loadings. Additionally, factor loadings that were less than 0.5 were deleted from the components. The output from the correlation matrix and the rotated component matrix give credence to the theoretical explanation that negotiation of co-ownership is enhanced chiefly by programme relevance. This is then followed by motivation, knowledge and skills engagement and core engineering knowledge and relevant skills.

Evaluation of model fit

The authors relied on the construct validity of the variables prior to testing the hypotheses in order to ensure that the factors that are necessary in enhancing negotiation of co-ownership among adult learners in HEIs could as well be measured by way of SEM. Subsequently, we relied on the results of the chi-square statistics and fit indices of RMSEA, CFI, NNFI and GFI (Hair et al. 2014). The fit indices obtained from the datasets actually support the hypothesised 5-factor categorisation model of negotiation of co-ownership among adult learners in HEIs – $[\chi 2\,(265) = 785.4, p < 0.01$; RMSEA $= 0.07$; CFI $= 0.965$; NNFI $= 0.91$; GFI $= 0.918]$. The result obtained falls within the acceptable threshold values of RMSEA $\leq .08$, CFI $\geq .95$, NNFI $\geq .90$, GFI $\geq .90$ as suggested by McDonald and Ho (2002).

Table 2. Rotated component matrix[a].

Descriptors	Items	Component 1	2	3	4	5
Programme engagement and involvement	ALE 1	.506				
Comprehension of theories and concepts	ALE 2	.549				
Adaptation to skills requirements in class and on field	ALE 3	.582				
Relate theories to job setting	ALE 4	.671				
Relationship between programme and job-skills needs	ALE 5	.613				
Programme enhances creativity	PRA 1		.789			
Programme is enriched with advanced technology	PRA 2		.740			
Programme promotes work ethics and discipline	PRA 3		.706			
Programme enhances critical thinking and problem solution	PRA 4		.672			
Programme is enriched with complex mathematical analysis	PRA 5		.536			
Relate course work to specific job requirements and roles	CEK 1			.677		
Relate peer interaction in lecture room to job skills needs	CEK 2			.705		
Ability to match learning outcomes to skills needs	CEK 3					
Core course content relate to actual work processes	CEK 4			.607		
Practical sessions provide detailed information for job needs	CEK 5			.511		
Adaptation to teaching and learning methods used by facilitators	NOC 1				.605	
Ability to contribute to the teaching and learning processes	NOC 2					
Provision of learning resources in class and laboratories	NOC 3				.631	
Teaching and learning methods are appropriate for adult learners	NOC 4				.775	
Ability to negotiate the lecture session and learning activities	NOC 5				.656	
Motivation to work in teams and independently	MOT 1					.505
Enthusiasm to comprehend advanced engineering processes	MOT 2					.521
Motivation to be professionally disciplined and result oriented	MOT 3					.570
Motivation to share knowledge and solve problems in teams	MOT 4					.714
Motivation to learn and use modern engineering technology	MOT 5					.645

Note: Extraction method: principal component analysis. Rotation method: varimax with Kaiser normalisation.
[a]Rotation converged in 7 iterations.

The structural model

Table 3 provides a summary of the results for the hypothesised paths.

The results of the hypothesis revealed that adult learners' engagement in HEIs had a positive effect on negotiation of co-ownership (H1a; $\beta = 0.01$, $p < .05$) as well as their core engineering knowledge and relevant skills (H2a; $\beta = 1.00$, $p < .05$). Conversely, the results showed that negotiation of co-ownership was not influenced by programme relevance (H1b; $\beta = -0.46$, ns) and adult learners' motivation to acquire further knowledge (H1c; $\beta = -2.73$, ns). However, adult learners' core engineering knowledge and skills revealed a strong relationship with negotiation of co-ownership (H1d; $\beta = 1.37$, $p < .05$) and motivation to acquire further knowledge (H2b; $\beta = 0.52$, $p < .05$). Details of the hypothesis results are provided in the discussion section of this study. The results of the hypothesised revealed overall good fit indices: $[\chi^2(265) = 785.4, p < .01; \text{RMSEA} = 0.106; \text{CFI} = 0.913; \text{NNFI} = 0.834; \quad \text{GFI} = 0.842]$

Table 3. Results of hypothesis testing.

Relationship	Hypothesis	C.R	Path Coefficients	*p*-Value	Empirical conclusions
ALE ◇ NOC	H_{1a}	0.17	0.01	0.05	Supported
PRA ◇ NOC	H_{1b}	−2.14	−0.46	0.07	Not supported
MOT ◇ NOC	H_{1c}	−7.35	−2.73	0.08	Not supported
CEK ◇ NOC	H_{1d}	3.56	1.37	0.01	Supported
ALE ◇ CEK	H_{2a}	5.97	1.00	0.01	Supported
CEK ◇ MOT	H_{2b}	5.23	0.52	0.01	Supported

with four of the six hypothesised paths significant and in the expected directions. In relation to our hypothesis, since the NNFI and CFI indices (also called the incremental fit indices) were included purposely to compare the hypothesised model to a null fitting model, the values $p > 90$ designate good fit. The negotiation of co-ownership model revealed an overall R^2 of 0.59 that signifies that 59% of the variance associated with model was accounted for by other variables (CEK, ALE, PRA and MOT) in the model.

Analysis of focus group interviews

This section reports on the focus group discussions with participants from the three universities and it also seeks to provide answers to the second research question. The first item for discussion was to ask participants about the extent to which their programme structure allows for active participation and negotiation of the learning process. One of the groups noted that, 'we contribute to the teaching and learning activities by proposing additional topics that could be included in our course' (PUB1). Another group from PBU added that, 'Yes, we consider our frequent engagement with our lecturers on the teaching and learning processes as an important aspect of our contribution to the programme structure … … however, we do not contribute to the development of our courses' (PUB2). The groups however indicated that they were not involved in the development of the curriculum as it was the responsibility of education providers to provide the curriculum. Two groups of participants from SPU noted that; 'no … .we are not involved in the development and design of courses although as workers we could contribute to the development of courses' (SPU1) and

> No, we do not play any role in designing or developing our courses … … however, we are able to agree on the scheduling of our courses with our lecturers when necessary as well as making some adjustments to the course aims and objectives. (SPU1).

They also indicated that they were able to share ideas with their peers and facilitators based on the topics discussed in class and the assignments given. One of the groups noted that, 'We are able to discuss our work processes and share ideas. Most of the theories connect to the work processes so we are able to discuss them with our facilitators' (PRU2). The responses from all the focus group participants showed that adult learners were able to negotiate field trips and factory floor visits, schedule lectures in consultation with lecturers and provide input in the course aims and objectives to reflect their knowledge and skills needs.

The second item for discussion was engagement of adult learners in negotiating and co-owning the teaching and learning processes. In order to ensure that adult learners match their specific knowledge and skills needs with the engineering programme, the researchers requested participants to provide information on their engagement in the various teaching and learning activities. One of the groups noted that, 'through interaction with our colleagues and facilitators, we relate the theories we learn in class with the relevant field work we undertake and this in a way help us to understand the course better' (PUB1). The response of adult learners from the specialist university was equally positive:

> the programme provide opportunities for us to share our experiences with our colleagues and facilitators which allows us to also develop our knowledge and skills … .however, we expect the department to collaborate with industry players to further strengthen the content of our programme. (SPU3).

The views of the participants revealed the importance of engagement between education providers and industry players. Another group noted that, 'the programme is relevant to our knowledge and skills needs and we are able to able to share the experiences we bring from our individual work place with our colleagues and facilitators' (PRU1). A third group from the private university however indicated that, 'although we consider our programme as relevant to our knowledge and skills needs, however, our concerns about the practical aspects of our course should be addressed' (PRU3). Importantly, while all the participants indicated adequate engagement with facilitators on the teaching and learning processes. However, a group identified some few challenges regarding their expectations that could be addressed by the university authorities to ensure that adult learners continue to negotiate co-ownership of their programmes.

Negotiation of co-ownership at the institutional level was the last item for discussion. All the groups however indicated that at the institutional level the most important items they considered as important were; internet connection, well-resourced laboratory, library with modern books and physical space for lectures. One of the groups added that, 'we requested the university authorities to provide us with internet on campus and they have satisfied our request' (SPU2). Another group indicated that, 'we have asked for a new laboratory with state of the art equipment and for the library to be stocked with new books but these have not been Provided'. Pressed further, the group indicated that, 'since this is an issue that affects all engineering students, we have presented our request as a group to management for consideration' (PRU2). The third group from the private university noted that, 'we consider the upgrading of our laboratories and frequent interaction with industry players should be considered by management as important to our academic work on campus' (PRU3). Another group noted that,

> we hardly communicate to the university authorities on issues regarding our learning needs because we consider the facilities and resources as good … ..our laboratories in Kumasi are well-resourced and we have access to all learning materials here at the learning centre. (PUB3)

The views of the participants demonstrate how institutional policies and practices that could either promote or hinder negotiation of co-ownership by adult learners at the institutional level. This also suggests that engagement of adult learners transcends teaching and learning in the lecture halls to include interaction with industry players as well the provision of learning resources that supports adult learners' knowledge and skills acquisition.

Discussion

We discuss our findings by drawing upon the results of our hypothesis testing, focus group discussions and interviews. In providing answers to research question one, we show that the two main factors that are necessary in the negotiation of co-ownership by adult learners are; the level of engagement in the teaching and learning process and their acquisition of relevant core engineering knowledge and skills. The study revealed that negotiation of co-ownership of learning is influenced by adult learners' engagement, particularly through the following: active classroom participation; clearly defined course aims and objectives as well as learning activities; effective interaction between learners and facilitators and agreeing with facilitators on field trips and laboratory activities. Through active classroom

participation, learners and facilitators interact thereby, creating a conducive learning environment that promotes knowledge sharing and a sense of ownership in the teaching and learning processes. Adult learners also negotiate co-ownership of learning when they are pre-informed of the course aims and learning activities because they are able to prepare adequately for each class, identify specific content which may connect to their work processes and contribute to discussions in class. Conversely, when adult learners do not experience adequate engagement in the teaching and learning processes, it hinders negotiation of co-ownership and reduces learners' involvement in the learning activities. Therefore, when adult learners' engagement is characterised by active collaboration with peers and facilitators (Bergmark and Westman 2016; Bunce, Baird, and Jones 2017), as well as congruence between effort, time and resources (Bryson 2016) negotiation of co-ownership is promoted. These findings however explicate the positive effect of adult learners' engagement on negotiation of co-ownership of learning and supports earlier research (Bergmark and Westman 2016; Neary et al. 2014; Schaap, van der Schaaf, and de Bruijn 2017) that suggests that learner-facilitator interaction and supportive teaching strategies enhance engagement of students.

The study also showed that negotiation of co-ownership of learning is strongly enhanced by adult learners' core engineering knowledge and skills. Key to engineering education is the development of the knowledge and skills of learners to cope with evolving technology and increasing expectations from employers. When adult learners communicate their knowledge and skills expectations and share their professional experiences with facilitators and peers, it allows them to negotiate co-ownership of the learning process. Contrariwise, when adult learners do not receive the relevant knowledge and skills in engineering, their professional development is affected and their ability to be ingenious and demonstrate proficiency in using advanced technology to solving workplace problems is limited. Previous studies (see Crawley et al. 2014; Romiszowski 2016) confirm the importance of knowledge and practical skills development of learners through applying complex programming tools, designing systems as well as understanding of the theory they take from class.

Surprisingly, the study did not reveal a strong relationship between programme relevance and negotiation of co-ownership of learning. One possible explanation for this finding is that, the adult learners did not have much input in the design of their courses – a practice that undermines the co-ownership concept in the teaching and learning process. In explaining the weak relationship between programme relevance and negotiation of co-ownership of learning, the authors posit that when adult learners do not provide input in the designing and structuring of their programmes, their efforts to measure their specific knowledge and skills needs against what they are provided, become limited. Cook-Sather (2014) also posits that when student is identified as subordinates rather than partners in the learning environment, it brings about fear and distrust which hinders effective interaction and co-ownership of the learning process. Another finding of the study is that, adult learners' motivation to acquire further knowledge is influenced by their personal career and performance goals rather than negotiation of co-ownership of learning. Some evidence suggests that life and work experiences are connected to individual motivation to obtain education qualifications (Snyman and van den Berg 2018). This further suggests that the adult learners sampled are intrinsically motivated to obtain further knowledge and skills for their personal and professional development which is not derived from co-ownership factors.

In providing answers to our second research question, we posit that the development of the knowledge and skills of adult learners through effective learner-facilitator and learner-learner engagement enhance negotiation of co-ownership of learning. Importantly, when consultations on aspects such as course aims, objectives, course content, teaching and learning methods, learning reLand, 2013sources and assessment processes are done with adult learners, it allows them to co-own their learning. Trowler (2010) argues that the dissemination of programme aims and objectives allows adult learners to prepare adequately for every course and to identify resources that will enable them to complete their programmes successfully. Modern engineering practice and technological advancement require professionals to be abreast with new developments in industry, therefore, when adult learners enrol in HEIs, their expectations include their acquisition of relevant knowledge and skills. Several authors (Huff, Zoltowski, and Oakes 2016; Land 2013; Romiszowski 2016) have explicated the importance of theoretical and practical knowledge for engineering students. The focus group discussion also showed that negotiation of co-ownership could take place at the institutional level between adult learners and providers of education. Institutional level negotiation of co-ownership of learning could include agreeing on the provision of learning materials, lecture room space, internet and laboratories.

In addition to influencing negotiation of co-ownership of learning, the study showed that adult learners' core engineering knowledge and skills also connect strongly with their engagement in the teaching and learning processes. What this finding means is that, effective learner engagement promotes knowledge and skills development that are relevant for personal and professional growth. Similar studies by Jafar (2016) show that through effective learner-facilitator engagement, learners collaborate to provide an effective learning environment that is also conducive for knowledge sharing and course design. However, our study did not reveal a high-end engagement that allowed adult learners to provide input in the design of courses as shown in the study by Jafar (2016). Our findings rather support Trowler's (2010) stance by arguing that, through engagement, adult learners establish a relationship between effort, time and resources, thereby developing their knowledge and skills.

Motivation to acquire further knowledge revealed a strong effect on adult learners' core engineering knowledge and skills. The responses from the adult learners revealed that they were motivated by both intrinsic and extrinsic factors to acquire further knowledge which would consequently lead to advanced knowledge and skills acquisition. This finding also confirms the results of other studies (Jafar 2016; Thorkildsen 2002) that posit that intrinsic motivation serves as a major determinant of learners' personal goal to acquire knowledge and skills. A similar study by Rothes, Lemos, and Gonçalves (2017) showed that high-end motivation directly impacts adult learners' engagement. The authors argue that a lack of motivation could affect the knowledge and skills acquisition by adult learners. Motivation is not only relevant in the process for the students alone but importantly, also for facilitators to understand how students develop their understanding and relate what they learn in a practical setting (Jarvis 2004).

Conclusion

We conclude that the process of negotiating and co-owning learning among adult learners in HEIs is chiefly influenced by the adult learners' level of engagement and their core

knowledge and skills anticipations. Therefore, through engagement, adult learners are able to explore their learning environments and negotiate co-ownership of their learning to obtain the best knowledge and skills required for their personal and professional development. Core knowledge and skills acquisition on the other hand could be a shared activity that involves discussion, practical activities and transformation of ideas into work capabilities required by employers. When adult learners are highly motivated to acquire further knowledge and skills, they communicate their expectations through engagement and also negotiate co-ownership of their learning which the authors consider as an essential educational democratic practice. In the absence of co-ownership, the benefits of exploring the course to the advantage of adult learners using mechanisms such as sharing of experiences, discussing industry emerging technologies and building hypotheses cannot be realised. We identified negotiation of co-ownership of learning among adult learners as a continuum with different layers of emphasis along the domains observed, especially depending on the mission, policies and practices of an institution. Therefore, while HEIs may have different systems that allow adult learners to negotiate co-ownership of their learning, it is important for adult learners to consult with facilitators and providers of education on the learning activities that would enhance their knowledge and skills acquisition. Finally, our study only focused on adult learners studying engineering programmes in higher education. We suggest that similar research should be conducted in other disciplines to reveal the differences that could arise from the different programmes. Additionally, comparison between negotiation of co-ownership at the institutional level and in the classroom environment could be explored to reveal the similarities and differences in the two settings.

Disclosure statement

No potential conflict of interest was reported by the authors.

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