

Facing up the challenge: improving graduate attributes within the Egyptian university sector

Introduction

Graduate attributes are important learning outcomes of higher education where many universities in Australia, UK and Egypt have implemented or currently in the process of implementing them in undergraduate degree courses. In most universities there has been significant work in the topic to improve graduate readiness for the labour market and thus reduce the skills gap and yet there is still uncertainty in the area of embedding graduate attributes into curricula. This paper examines the reasons behind the limited implementation of graduate attributes including the reasons influencing the variation in their interpretation, providing a more theorised analysis of the specific nature of graduate attributes and the implications for higher education. It debates that graduate attributes are at the nexus of a number of complexities in the teaching environment and hence are influenced by context, and this paper investigates some of the underpinning reasons and in doing so argues that it is the very context specific nature of graduate attributes that explains their limited implementation. Policy has driven pedagogy without a critical examination of the context in which both are implemented and this paper explains the impact of that on graduate attributes implementation in courses. Complexity theory (Morrison 2008; Mason 2008; Haggis 2008) is the framework used for analysing the contextual factors affecting the ways in which graduate attributes are conceptualised in the Egyptian context. This paper empirical work is based on semi-structured interviews with academics and graduates from computer engineering in two Egyptian universities; one that is private and another that is public. It is also based on semi-structured interviews with employers serving the computer or information technology labour market in Egypt.

There has been considerable research into graduate attributes (Harpe et al. 2000; Crebert et al. 2004; Yorke and Harvey 2005; Sumsion and Goodfellow 2004; Barrie 2004; Barrie 2006; Barrie 2007; Barrie 2009; Green et al 2009; Jones 2009; Hughes and Barrie 2010; Harpe and David 2012; Jones 2013). Much of this research has been based on discussing the initiatives done such as producing curriculum maps to show areas of graduate attributes and their development in taught courses using a number of tools such as: Gibbs et al.'s Matrix

(Sumsion and Goodfellow 2004; Barrie 2006; Harvey and Kamvounias 2008), the graduate qualities grid (Medlin et al. 2003), and the transferable skills template (Atlay and Harris 2000). Also the attempts to explicitly articulate and implement various combinations of graduate attributes and career management skills using Bloom's Taxonomy in courses (Barrie 2004; Bridgstock 2009; Harpe and David 2012); adopting student centred, content focused strategies such as Work Integrated Learning (WIL) and Problem Based Learning (PBL) to allow students to actively share, practice and obtain feedback on their qualities (Harpe et al. 2000; Hughes and Barrie 2010; Harpe and David 2012); improving academics' literacy in teaching and learning graduate attributes in courses (Harpe and David, 2012); and engaging industry members, careers office staff and students in the design of the curriculum (Leckey and McGuigan 1997). Specifically there has been studies which examine the relationship between graduate attributes and the teaching context (Jones 2009; Jones 2013), the barriers to the teaching of graduate attributes (Jones 2009) and the factors affecting their teaching (Harpe et al. 2000; Sumsion and Goodfellow 2004; Barrie 2004; Barrie 2006; Barrie 2007; Barrie 2009; Green et al 2009; Jones 2009; Barrie 2010; Hughes and Barrie 2010; Harpe and David 2012; Jones 2013). The definition of graduate attributes and their place in taught courses, academics conceptualisation of the concept and how it should be acquired by students have been discussed in length in the literature (Sumsion and Goodfellow 2004; Barrie 2004; Barrie 2006; Barrie 2007; Barrie 2009; Green et al 2009; Jones 2009; Barrie 2010; Hughes and Barrie 2010; Harpe and David 2012; Jones 2013). Rather than a renewed emphasis on these studies which were not sufficient in the context of teaching strategies to effectively promote the development of generic attributes, there is a need to a more pragmatic framework or a new lens that appreciates the critical connection between context and the notion of graduate attributes and it is these that this study sets out to explore using complexity theory.

The work of this study is based on in depth semi-structured interviews with 11 academics and 9 graduates in two different computer engineering undergraduate programmes; one that is private and another that is public. It is also based on collecting data from 10 Egyptian employers related to computer engineering (e.g. software development and network administration). In addition to interviews, copies of the Quality Assurance and Accreditation

Handbook for higher education in Egypt (HEEP 2009b), the law governing Egyptian universities (SCU 2006), status reports which describe programmes and courses specifications were collected to understand the ways in which graduate attributes are described, understood and assessed by academics in the Egyptian educational context. Interviews were between 60-70 minutes in length. Interviews were semi-structured in nature with open ended questions to explore participants' perceptions in various areas related to graduate attributes. This technique was useful for asking probing questions as well as seeking clarifications from participants if necessary. Interviews were tape recorded and transcribed as verbatim. Data was analysed using template analysis which generated a number of codes through cross checking across all transcripts and documentations. From this coding, common patterns or themes were identified and refined. Relationships identified in the coding process were then confirmed, changed or discarded. The main themes into which data were coded included perceptions of graduate attributes, development of graduate attributes in courses, central role of faculty, quality measures and barriers to developing attributes in courses.

This study through the lens of complexity theory found that the teaching and conceptualisation of graduate attributes is influenced by the complex context in which they are taught or implemented. The study was confined to Egyptian academics' conceptualisation of graduate attributes. In exploring the specific nature of graduate attributes, this paper provides a way of understanding the contextual factors affecting the teaching of graduate attributes in undergraduate degree courses. It argues that in order to effectively implement graduate attributes, it is important to analyse the context in which this occurs. The central debate is that the teaching of graduate attributes is influenced by contextual factors such as academics recruitment, promotion and progression procedures, department/faculty culture, scholarship of learning and teaching, performance appraisal, the pay scale, fringe benefits, remunerations, incentives to conduct industry based research, collaborative projects or industry secondments and industrial practitioners potential to teach in academia. Thus graduate attributes are at the nexus of a number of complexities and it is those which this paper aims to explain.

Framework for analysis

Complexity theory is a framework for explaining open, dynamic and complex systems which consist of a large number of smaller overlapping types of organised systems that interact in a linear/non-linear manner at a local level (Morrison 2008; Mason 2008; Haggis 2008). Complexity theory is used to understand or conceptualise knowledge in a specific context which can be used in relationship to existing practices (Haggis 2008). One of the strengths of the theory is that it focuses upon the relationships and interactions that occur within open systems rather than extracting a general principle or a key factor. This means that relationships which exist between the different activities, functions or causalities in the system are not discounted (i.e. A causes B) to create patterns of data from the relation of different activities with each other. Instead and with assumptions about time, multi-factor causality, and emergence, complexity theory conceptualises context through the different factors crucially associated in relation to each other assuming that what emerges depends on what interacts. One of the weaknesses of complexity theory is that it does not provide a complete picture of education because it gives no guarantees. It is a theory without responsibility, accountability or predictability and certainty is elusive. This means that even with an understanding of the contextual factors underpinning the skills gap, there is no guarantee that the skills gap will be improved.

Egyptian universities as complex systems

Complexity theory is a useful means of analysing the Egyptian university context as it takes into consideration and seeks to explain the critical connections, factors or causalities affecting the teaching and learning of graduate attributes and so is a way of understanding the different conceptualisations of graduate attributes that academics hold. Through the lens of complexity, the Egyptian higher education system is pictured as a complex structure consisting of a large number of smaller systems such as: universities, faculties, educational programmes, councils, committees, administrative structures, and stakeholders (e.g. academics, students, graduates and employers). These smaller systems across the time have interacted together through a number of activities, functions or work processes to produce a certain effect or result. However, these functions cannot be reduced to a single

factor (i.e. A caused B) because they are all critically associated in relation to each other directly or indirectly. For example the Ministry of Higher Education governs universities through the Supreme Council of Universities which consists of universities presidents, vice presidents, and experts on higher education using a number of policies and procedures (SCU 2006; MOHE 2007; SCU 2010). Universities in turn supervise their faculties through internal regulations and bylaws (SCU 2006). Furthermore faculties administer academics, staff and students through their educational programmes. All these smaller systems and their interactions together across the time and through different educational processes and activities have allowed the emergence of the current status of university in Egypt including academics' conceptualisations and educational practices. It is possible that these interactions have happened too quickly to be predicted, yet their impact on education can be ignored. In this area complexity theory in comparison to all previous studies provides a different way of conceptualising higher education through the multi-layered exploration of context in terms of systems connectedness, multi-factor causalities, and emergence through history of time (Haggis 2008). Based on these assumptions the Egyptian university system was analysed contributing to the different contextual factors affecting the implementation of graduate attributes in computer engineering undergraduate courses. In detail these factors are discussed in the next section

Results

A: Perceptions of graduate attributes

All academics, irrespective of their faculties, had different understandings of graduate attributes. For instance, public academics perceived them as “characteristics” that graduates should possess, “abilities” that graduates need in order to carry out some engineering tasks, “skills” gained by students from taught courses, “an understanding” of labour market needs and “a non-technical skill” attained by the graduate. With respect to private academics, they perceived graduate attributes as “things that allow graduates to compete” in the labour market, “abilities” that graduates gain from the educational process, “attitudes” or professional engineering “ethics”, or “things” required for employment or “qualities” needed for work. Documentations such as the Quality Assurance and Accreditation Handbook (QAAP 2004, p.71-72) and NARS for engineering (NAQAAE 2009) classified graduate attributes under

three different categories: intellectual skills, professional and practical skills, as well as general and transferable skills. In previous studies, Barrie (2004) and (2006) identified four different qualitative conceptions that academics hold for graduate attributes. These logical in sequence conceptions were: precursory, complement, translation and enabling. By comparing these conceptions to Egyptian public and private academics' perceptions of graduate attributes it could be said that academics irrespective of their faculties had different as well as interchangeable understandings of graduate attributes, yet consistent with some of Barrie's (2004) and (2006) different conceptions. For example, some academics understood graduate attributes as complementary to disciplinary knowledge, that is they are part of the usual course curriculum yet they do not interact with disciplinary knowledge, whereas some academics understood them as abilities that make use, apply or translate disciplinary knowledge in the world. As for the Quality Assurance and Accreditation Handbook (QAAP2004, p.71-72) and NARS for engineering (NAQAAE 2009) when compared to Barrie's (2004) and (2006) four qualitative conceptions, it could be said that quality documentations used different terms to express graduate attributes without a clear explanation of what each term means. For example, graduate attributes were categorised as intellectual skills, professional and practical skills, as well as general and transferable skills without an understanding of what they mean, yet with only few examples to clarify each category. Also when comparing these interchangeable terms to academics' perceptions of graduate attributes, it could also be said that there was a difference in terms used. For example, academics interchangeably described graduate attributes as the abilities, attributes, characteristics or non-technical skills that complement disciplinary knowledge or translate disciplinary knowledge into the world, whereas documents described them as abilities gained upon completion of a course of study. In light of all these variations and differences in interpretations between academics' perceptions of graduate attributes, documentations expressions of graduate attributes and Barrie's four qualitative perceptions of academics' understandings of graduate attributes, it could be suggested that:

Variation in understandings would suggest that some academics are unlikely to be receptive to calls for a university education to address the development of such attributes and provides an insight into some of the reasons that may underlie the inconsistent implementation of graduate attributes curricula (Barrie 2006, p.238).

Based on such argument (Barrie 2006), it could be said that there is uncertainty on the part of academics as to what these concepts point at the undergraduate level. It could also mean that meanings of graduate attributes are different within and across the faculties and therefore there is no single way of understanding the concept but that academics rather have a range of interpretations. Such an outcome deliberately points attention (Barrie 2006; Barrie 2009; Jones 2009; Jones 2013) as to why there is an uneven implementation of graduate attributes as students' learning outcomes in taught courses.

B: Development of graduate attributes in courses

Academics irrespective of their faculty stated that graduate attributes are developed in taught courses in different ways depending on the nature of the course. For example, they could be gained by students through a course taught separate from disciplinary knowledge, or as part of the taught curriculum. As for attributes assessment in courses, interviewed academics stated that there was no fixed method for assessing graduate attributes in courses and it all depends on academics' views of the course. With respect to Barrie (2007) study outcomes, it identified six different categories of academics' conceptions of how students acquire generic attributes from taught courses. These were: remedial, associated, teaching content, teaching process, engagement and participatory. By comparing these conceptions to Egyptian public and private academics' teaching and learning methods, it could be said that all academics irrespective of their faculties had different as well as interchangeable teaching and learning methods of graduate attributes, however consistent with some of Barrie's (2007) different conceptions. For example, some academics encouraged their students to acquire graduate attributes through their engagement with the learning process while in university, whereas other academics encouraged their students to acquire graduate attributes as a core element of the course content or through their engagement with the learning process while in university. Nevertheless, students' acquiring graduate attributes through their courses was the most common approach employed by academics. As it became evident by interview data, these approaches were self chosen by academics as they were not advised by the Quality Assurance and Accreditation Handbook (QAAP 2004) or NARS for engineering (NAQAAE 2009). Similarly wise were attributes assessment techniques which were decided by

academics according to the nature of the course using a number of activities such as presentations, seminars or quizzes to assess their students' abilities. The cause of this could be referred to academics' different conceptualisation and development of attributes in courses as Barrie and Hughes (2010 p.328) suggested.

Perceptions of the very nature of graduate attributes are central to the ways in which they are taught and assessed.

In light of all these variations and differences among academics as to how graduate attributes are to be developed in courses as compared to Barrie's six qualitative conceptions, it could be suggested that:

This difference in perspectives reflects fundamental differences in how these academics conceive of what generic attributes are and how they are developed explains the reasons for the limited implementation of graduate attributes within university courses (Barrie 2007, p.441 & p.454).

Accordingly and with reference to Barrie (2007) and (2009), Jones (2009) and Barrie and Hughes, (2010), it could be said that the different conceptions for developing, teaching and assessing attributes in courses together with the previous notion that academics have different conceptual understandings to what graduate attributes are means that the academic community is not having the same notion about graduate attributes. It also means that graduate attributes mean different things to different people responsible with developing, delivering and assessing a university education. Such an outcome points attention (Barrie 2007; Barrie 2009; Jones 2009; Barrie and Hughes 2010) to the cause for the inconsistent implementation of graduate attributes as students' learning outcomes in taught courses. Moreover, and through an insightful comparison between the attributes academics suggested to embed in their courses, the ones articulated in their course specifications and the "general skills" requirements of NARS for computer engineering, it could be said that there were inconsistencies. NARS, for instance, suggested a number of attributes for computer engineering education. These were: "collaborate effectively within multidisciplinary team," "work in stressful environment...," "communicate effectively...," "demonstrate IT capabilities...," "lead and motivate individuals..." (NAQAAE 2009, p.8-9). Course specifications on the other hand reflected other attributes such as "use general computer and software tools professionally" or "use general computer and software tools professionally. With respect to Barrie (2006) and (2009), Green et al. (2009), Barrie and Hughes (2010) they all argued that

lists of attributes developed by different stakeholders (e.g. quality assurance agencies) may have variable descriptions of graduate attributes which can range from simple technical skills to complex intellectual abilities. Accordingly, such variance does not often appear clear to academics, which leaves the stated outcomes open to different interpretations and thus a potential to uneven implementation of graduate attributes in courses. When questioned about their awareness of attributes attained while in faculty, all graduates commented that most of their academics did not inform them of the attributes developed in taught courses. In that regard the literature ensured their significance and cruciality to the successful implementation of the learning outcomes (Dearing 1997; Crebert et al. 2004; Yorke and Harvey 2005; Barrie 2009; Barrie and Hughes 2010). Accordingly and based on this argument, any failure in involving the student in directing his/her own learning through negotiating the attributes developed and assessed in courses affects the success of the teaching and learning experience. It could therefore be suggested that students' centeredness affects students' learning outcomes as no matter how much effort is put into teaching graduate attributes, the strategy does not work unless students actively perceive and engage in the development of graduate attributes.

C: Central role of faculty

Most public academics agreed that it is not the role of the faculty to equip its graduates with the necessary attributes for employment. However, private academics agreed that it is merely the role of the faculty to equip its graduates with the necessary attributes for the labour market. Jones (2009) stated that the consequence of ignoring, the university central role in equipping students with the necessary attributes was that generic attributes disappeared into disciplinary knowledge and were not given any attention even if academics stated that their teaching was based upon these attributes, Jones (2009, p.186) also said that:

One of the factors for uneven implementation of generic attributes is that they are not seen integral to the core business of university teaching.

From that perspective, it could be said that academics' lack of awareness of the central role of the university in equipping its students with the necessary attributes for employment caused the uneven implementation of graduate attributes in courses.

D: Quality measures

All public academics perceived their faculty effective in preparing graduates for the labour market because graduates are recruited immediately into the labour market. Yet, most private academics perceived their faculty ineffective in preparing its graduates for the labour market because the faculty mainly focuses on teaching technical knowledge rather than attributes. All graduates perceived their faculties as ineffective in preparing them for the labour market and stated that there is a big gap between the attributes required for employments and the ones taught in courses. Employers also stated that universities are not doing enough to prepare their graduates for the labour market because they mainly focus on teaching technical knowledge. With respect to the literature, Abdallah et al. (2008), OECD (2010), Kandeel (2011), Bond et al. (2013), Korany (2011), El Nashar (2012) and UNESCO (2012), all stated that Egyptian universities remain criticised for not improving graduates' readiness for the labour market because their faculties mainly focus on the technical aspects of the curriculum rather than the attributes required by the labour market. From that perspective, it could be said that the emphasis placed on technical course content affects universities effectiveness for the labour market, particularly graduates' readiness for the labour market.

E: Barriers to developing attributes in courses

Interviewed academics stated a number of factors which they thought to affect attributes development in courses. These factors were: attributes assessment strategies, centralised management, class size, faculty teaching load and lack of communication with the labour market. One public academic (DAC) suggested that the strategy adopted by his department, which allocates a large share (80%-90%) of the course marks to final examinations, has encouraged students to focus merely on course technical content rather than coursework assignments. He also said that the university centralised management system which adopts a top down approach acts as a barrier to change assessment procedures even if academics want to. (DAC) commented that such centralised management system affects course management since the university is the entity that controls the teaching process. With respect to the law governing universities through its clause part I: Clause 4: sub clause 51 and 55: educational programmes (SCU 2006) informed that educational programmes are to establish

their own internal educational procedures that describe their courses structure, outline, textbooks, references and methods of assessments. By comparing (DAC) thoughts to clause 51 and 55 of the law governing universities it could be argued that the law does not constrain attributes in courses since it allows academics enough flexibility to decide on their own assessment procedures. This means that some academics are not aware of the requirements of the law regarding students' assessment procedures which explains why there is an uneven implementation of graduate attributes as students' learning outcomes in taught courses. Other public academics said that high students' numbers is the main cause for all educational problems which if solved, all problems within the higher education context will be solved. They suggested that large class sizes allowed most professors to focus on the technical side of the course rather than the non-technical side. They also agreed that decreasing academics' teaching load will allow them more time to focus on attributes development in courses since it requires a lot of preparation time unlike the technical skills which already exist in books. Previous studies stated that large students' number and high teaching loads have a profound effect on teaching and the construction of graduate attributes (Sumsion and Goodfellow 2004; Jones 2009; Jones 2013). Yet, from the available data, the computer department has an average students' number (60-70) in comparison to other departments such as civil engineering which can have up to 1300 students. Also, the law governing universities sets a teaching load of 12 hours per week for assistant professors or professors in order to allow enough time for course preparation and delivery (SCU 2006). By comparing the findings of the law, students' numbers inside the department and faculty workload, it could be argued that class size and faculty workloads do not constrain attributes in courses as suggested by public academics. This means that some academics are not aware that class size and faculty workload do not affect attributes implementation in courses, which in turn explains why there is an uneven implementation of graduate attributes in taught courses. Furthermore two private academics said that the teaching and development of attributes is not supported by the faculty since most academics remain aware of employment needs informally through their friends and graduates. This is because: there is no communication or discussion inside the department or the faculty in what relates to graduate attributes or employment demands. Through an insightful reading to Advisory Board meeting minutes, they revealed that every six

months there is an industrial committee meeting that gathers CEOs and department heads in the faculty to discuss all aspects of employability. From the minutes of these meetings, it could be understood that CEOs advised academics to take the initiative to solve industry problems as currently they are not keeping track with the industry need which requires their experiences. They also advised academics to take the initiative to visit the industrial sector to understand its problems and try to solve them. CEOs also emphasised the importance of changing curricula to address certain employability skills such as teamwork, which is a necessity for employment. The outcomes of documentation analysis suggest that communications with the labour market occur on the faculty level and thus are not a principal cause to affect attributes implementation in courses. This means that some academics are not aware that there is a system in place to communicate with the labour market, which explains the limited implementation of graduate attributes in taught courses.

To this end, it could be said that a number of factors that affected the teaching of attributes in courses and thus students' learning outcomes and eventually the skills gap. These factors were: academics' conceptual understanding of graduate attributes, their development and assessment in courses; students' lack of awareness of the nature of attributes embedded in courses; attributes embedded in courses are not consistent with NARS; and the few academics who think that the faculty does not have a central role in equipping its students with the necessary attributes. It could be said that there is no major difference between the public and private faculty except for academics in the public faculty who think it is not the faculty's central role to equip its graduates with the necessary attributes for employment. These generated factors could be classified according to the literature into: pedagogical, epistemological, student centeredness, quality assurance and cultural factors (Barrie 2009; Barrie and Hughes 2010; Green et al. 2009; Jones 2009). As such, it could be suggested with reference to the literature that academics in Egypt, UK and Australia share common factors regarding the uneven implementation of graduate attributes in taught courses which means that the skills gap is a common phenomenon found across countries. With particular focus on the Egyptian context, it could be said, based on research findings, that the public and private faculties share common factors that affect teaching of attributes in courses. Although, both faculties have different management systems, the similarity of findings could be understood

and referred to the context under which they operate. For instance, they are both governed by the same law governing Egyptian universities (SCU 2006) and unit which is the Supreme Council of Universities (SCU 2006; MOHE 2007; SCU 2010). These two aspects could be influencing the context under which academics of the private and public faculty operate, leading them to behave in a common way. With further reference to the literature, it could be suggested that public and private academics' different conceptual understanding of graduate attributes, their development and assessment in courses had the most significant impact on students' acquisition of attributes and thus learning outcomes. This is not to suggest that other factors are not important, but to stress that the variation in the interpretation of the concept among academics is most significant or influential to attributes development in courses and thus students' learning outcomes. This has been previously identified by various authors (Harpe et al. 2000; Sumsion and Goodfellow 2004; Barrie 2006; Barrie 2007; Barrie 2009; Barrie and Hughes 2010; Green et al. 2009; Jones 2009; Harpe and David 2012; Jones 2013). In order to understand why this variation in interpretations occurred among private and public academics, irrespective of their context, as well as why academics believed that attributes assessment strategies, centralised management, class size, faculty teaching load and communication with labour market constrain the teaching of attributes in courses, by using complexity theory the educational context in which they exist was analysed and explained. This is discussed in the next section.

The Egyptian context through the complexity Lens

Complexity theory assumptions about context provided a different way of looking at Egyptian academics' work practices and behaviours with respect to the conceptualisation of graduate attributes as well as the other factors presented in study results. Through its different assumptions about time, system connectedness, multi-factor causality and emergence, it could be said that Egyptian academics' work practices and behaviours across the time emerged due to a number of factors that existed in their teaching context. Through an insightful look into academics' teaching community based on the outcomes of data analysis which were almost similar across both contexts, it could be said that there are a number of critically connected contextual factors that affected graduate attributes implementation in

courses, or academics' work practices and behaviours to the teaching and learning of graduate attributes in classes, irrespective of their faculties. First, the recruitment process of the faculties which allows only graduates of high academic excellence at the bachelor level to be appointed as academics without a teaching qualification and continuing in the system without penalisation or sifting at any stage (SCU 2006; UNESCO 2007). According to the law governing Egyptian universities

Part III, clause 1, sub clause 68 & 136: appointed faculty members must: be graduates of the same department, have a grade of very good or higher in the required speciality (SCU 2006, p.18 & 28).

Such recruitment system has indeed encouraged and privileged distinctive graduates to work back into their system. However, it limited and constrained the emergence of new innovative teaching and learning methods, thoughts and hence practices, which allowed them to teach and assess students the same way they have been taught and assessed (UNESCO 2007; OECD 2010). As one of the public academics commented, "everyone tries to imitate his professor." Such a mechanical system does not only create an imitated or iterative method of course teaching, learning and assessment, but rather an academic/department culture/environment that embeds imitated thoughts, work practices and behaviours (Divedi 1995; Greenberg and Baron 2000; Johns and Saks 2001; Dawson 2010). As such, academics might have become less motivated and empowered to recognise, introduce and affect change in the implementation of their work practices affecting therefore work effectiveness. Second, academics are only required and favoured to conduct academic disciplined research for their career progression as well as academic promotions according to the requirements of the Supreme Council and the internal regulations of their departments.

Part II, clause 1, sub clause 69 #2: Faculty members shall conduct academic disciplined research and publish them as appropriate (SCU 2006, p. 17).

In academics' context there is no obligation for scholarship of teaching and learning (SOTL) although academics are encouraged to attend as part of their professional development a number of training courses offered by the National Centre for Faculty and Leadership Development related to teaching, scientific research, communication and leadership (SCU 2006; HEEP 2009a). However, training is not always an effective mechanism for changing and developing cognition since it lacks the continuity of practice as suggested by Chalam

(2006). Tying academics' promotions and progression into the system only to technical disciplinary research or projects can be principally indicted to affect and direct academics to favour technical knowledge. This created with time an academic culture that favours technical knowledge only. Third, there is no formal feedback system to appraise academics on their academic performance (UNESCO 2007; OECD 2010; SPU 2010), hence they remain unaware of their potential areas for improvement. This could be argued to have affected academics' awareness, understanding, motivation and empowerment to introduce change to their learning and teaching practices hence leaving their practices unchanged. Fourth, the work environment contains a number of variables such as: the pay scale, fringe benefits, remuneration and lack of equal opportunities which could be inappropriate, frustrating giving academics excuses to stay detached from the system and its operational procedures and hence leaving teaching practices unchanged (UNESCO 2007; OECD 2010) Fifth, no incentive or encouragement to conduct industry based research or collaborative projects although CEO have invited academics to do so in their meetings. Sixth, industrial practitioners are not allowed to teach in academia because of the regulations set by the law governing Egyptian universities which allows academics only to teach (SCU 2006). These two last aspects could be argued to have affected the potential of bringing in practitioners from the labour market into academia and vice versa which can be quite useful for the experiences of both contexts (Leckey and McGuigan 1997; Harpe et al. 2000). Finally the faculty system does not encourage or provide incentives for industry secondments (SCU 2006, p.21).

Part II, clause 2, sub clause 84: Academics may be delegated to work on full time or part time basis in other universities or other works subject to the approval of the department council followed by the college council then the president of the university.

This indeed could be useful for academics to learn more on engineering technical and non technical practices through real life experiences which potentially develop their awareness as to how courses can be developed.

Conclusion

This paper has examined the contextual factors which affect the teaching and learning of graduate attributes. It argued that graduate attributes are complex and require a multi-layered

examination of the context in which they are implemented. The findings of this study suggest to higher education authorities that if an academic is to engage in teaching and assessing attributes in undergraduate courses, attention should focus on a number of factors. These are: academics' conceptual understanding of graduate attributes, their development and assessment in courses; students' awareness of the nature of attributes embedded in courses; faculty central role in equipping students with the necessary attributes. According (Barrie 2009; Barrie and Hughes 2010; Green et al. 2009; Jones 2009), these factors could be grouped into:

- Epistemological: academics' different conceptual understanding of graduate attributes, their development and assessment in courses.
- Pedagogical: the gap between the attributes embedded in computer engineering courses and NARS requirements.
- Student centeredness: students are not kept aware of the attributes developed in courses.
- Cultural: attributes are not seen as one of the central roles of the university teacher.

By applying complexity theory across the full range of data, the contextual factors that caused the limited success of graduate attributes implementation and thus the skills gap were revealed. These factors for both contexts were: academics' recruitment, promotion and progression procedures, department/faculty culture which has an orientation towards disciplinary knowledge, lack of scholarship of learning and teaching, performance appraisal, the pay scale, fringe benefits and remuneration, no incentive to conduct industry based research, collaborative projects or industry secondments and industrial practitioners are not allowed to teach in academia. The reason that both contexts reflected similar factors is grounded to the Egyptian higher education context which governs universities with the same law (SCU 2006). The key conclusion from this research is that it is possible, given the appropriate contextual conditions, that academics' teaching and learning of graduate attributes in undergraduate degree courses could be improved. This research has shown that a concept such as graduate attributes is at the nexus of a number of complexities that affect their teaching and assessment in taught courses. Yet, these complexities are not only pedagogical, epistemological or cultural but also contextual. Based on this, it could be said

that graduate attributes are context specific that is they have a very situated nature that is influenced by the activity, discipline, culture or context in which they are taught. To the end of this study it could be understood that because the contextual conditions influencing the effective implementation of graduate attributes were overlooked in contexts of studies that the implementation of graduate attributes was patchy and of limited success.

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