

EXAMPLE-BASED LEARNING FOR INFORMATION PROBLEM SOLVING  
IN ARABIAN GULF HIGHER EDUCATION

by  
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## **Abstract**

Higher education students in the Arabian Gulf face barriers to careers that require 21st century competencies such as information literacy, an essential skill for engagement in the global knowledge economy. Gulf leaders have established Western-modeled higher education institutions that emphasize these skills, however employers report a gap between their workforce requirements and their satisfaction with the quality of Gulf graduates. Theoretical and empirical research related to these gaps suggest that Western curricula and pedagogy may be misaligned with Gulf students' academic culture and Arab-Islamic epistemology. This research study collected data through a Gulf-wide six-country online survey to understand Gulf academic staff perceptions of information literacy, and their teaching and learning background. Based on the empirical evidence collected and a review of the literature, the study implemented an instructional intervention based on Renkl's (2014) instructionally oriented theory of example-based learning (EBL) and gathered proof of concept for Gulf higher education academic staff of transitioning from a teacher-led to student-centred approach using EBL. The learning domain of the intervention was the first two steps of Brand-Gruwel, Wopereis, and Walraven's (2009) information problem-solving (IPS) schema and skills, defining the problem and searching for information. An embedded mixed methods design was used, combining a traditional pre-test/post-test experiment with three treatment conditions with qualitative data collection to implement example-based learning within a college introductory research course for undergraduates. The treatments consisted of two different EBL orienting activities, self-explanation and explanation-help, while the control group received no treatment. Performance and perception data related to

information problem-solving schema, skills, and behaviour were analyzed using descriptive and inferential (*t*-tests, ANOVA, ANCOVA) statistics. Findings indicate significant improvements in performance of IPS skill one - define the problem – by the two treatment groups at retention, and the explanation-help group significantly outperformed the self-explanation group on the same skill immediately following both post-tests but not at retention. Results also suggest significant main effects for the EBL treatment and English language proficiency, and no significant difference between the two treatment groups at retention. Participants’ assessment of the training was positive, and overall, the explanation-help group ratings for both usefulness and difficulty of the training were the highest, though not significantly. Empirical research indicates that explanation-help scaffolds are well-suited when students are not yet able to fully or accurately explain the learning domain principles. The results provide support for the role of worked examples to support schema and skill development for novices, and emerging proof of concept for the use of EBL to transition from teacher-centred to student-centred with worked example scaffolds.

**Doctoral Advisory Committee:**

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Dr. Carey Borkoski, Johns Hopkins University

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## **Dedication**

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## Executive Summary

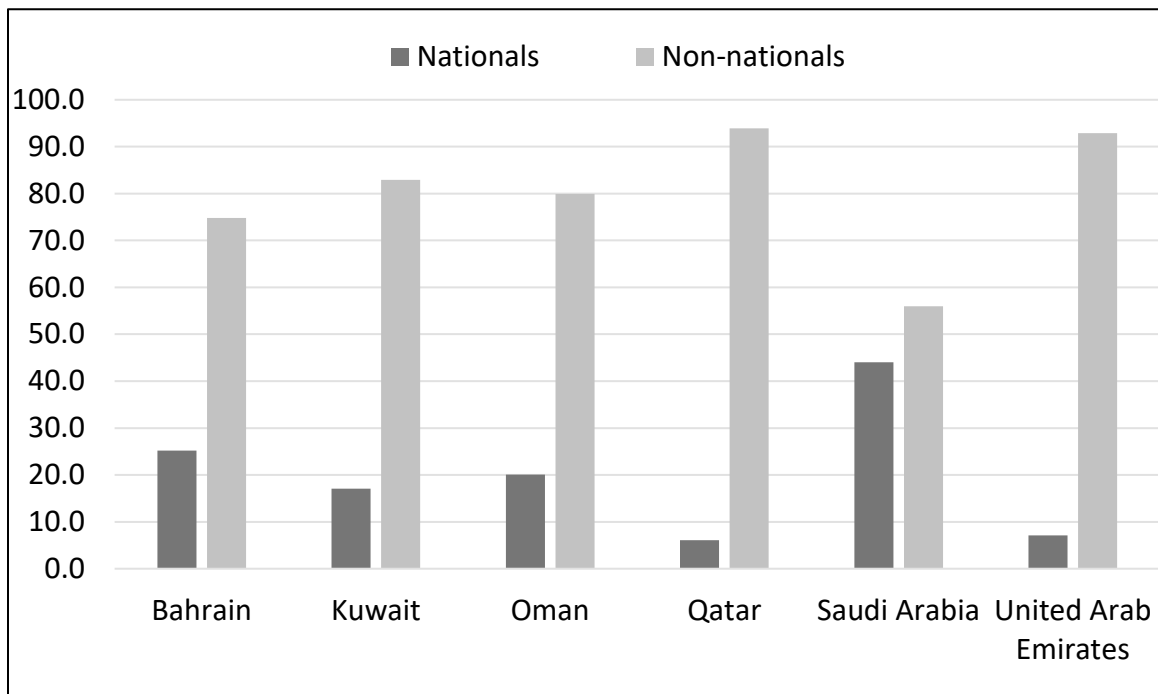
### Background

The capacity to navigate the complex processes and systems required to access information and build knowledge is of daunting importance in the current global transition to an information society and knowledge economy. This capacity, termed information literacy (IL), involves determining the kind of information needed, and evaluating, using, communicating, and managing the information ethically and responsibly (American Library Association, 2016; Chartered Institute of Library and Information Professionals, 2013; International Federation of Library Associations, 2015). The United Nations Educational, Scientific and Cultural Organization (UNESCO) deems information literacy to be a basic human right and beacon of the information society, empowering people “to achieve their personal, social, occupational and educational goals” (UNESCO, 2016). Information literacy represents a “meta-competency” or “currency” of the knowledge economy (Lloyd, 2003, p. 87), however, despite its role in society and the economy and its relevance to all fields, disciplines, and contexts, information literacy is not an explicitly taught discipline in higher education per se (Weiner, 2014). This is concerning primarily because research in workplace and education environments indicates that although all age groups have sufficient *functional* skills (e.g., web browsing, downloading apps) to operate digital tools and software, their *information problem-solving* skills are absent, or at best, underdeveloped (Brand-Gruwel et al., 2005; Cyphert & Lyle, 2016; Frèrejean et al., 2016; van Deursen & van Dijk, 2009; van Deursen & van Diepen, 2013). This paradox suggests the need to raise the status of information literacy in higher education curricula and instruction, as reflected in the

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urgency of Bruce’s (2002) address to UNESCO in which she characterizes information literacy as “the critical literacy for the twenty-first century” (p. 1).

For regions such as the Gulf Cooperative Council (GCC, Arabian Gulf, or Gulf), strategic efforts to transform into an information society and knowledge economy will depend largely on the information literacy capacity of Gulf nationals and the reduced reliance on foreign nationals, who currently represent 56 to 94% of the employed population in the Gulf, according to the Gulf Labor Markets and Migration programme (GLMM, 2018), as illustrated in Figure 1, below.



*Figure 1.* Percentage of employed nationals and foreign nationals in GCC countries. Data from the Gulf Labor Markets and Migration (GLMM) programme (2018) utilized for non-commercial purposes.

Gulf countries’ reliance on foreign labourers and knowledge workers is largely due to a gap between employers’ requirements for an increasingly knowledge-based workforce

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and their satisfaction with the quality of Gulf national graduates (Ashour & Fatima, 2016; Hijazi, Zoubeidi, Abdalla, Al-Waqfi, & Harb, 2008). To illustrate, the United Arab Emirates (UAE) private sector employs only 0.5 to 1.3% of nationals (Austin, Chapman, Farah, Wilson, & Ridge, 2014; Forstenlechner, Selim, Baruch, & Madi, 2014).

Addressing this gap as well as the labour imbalance will require a national workforce empowered with information literacy. The current study examines factors that may contribute to this gap, and describes an instructional intervention driven by Bruce's (2002) assertion that in this information- and knowledge-dependent era, "information literacy education is the catalyst required to transform the information society of today into the learning society of tomorrow" (p. 1).

### **The Problem: Information Literacy in Gulf Settings**

In the Arabian Gulf, higher education graduates face barriers to careers that require 21st century competencies such as information literacy (Bendriss, Saliba, & Birch, 2015; Martin, Birks, & Hunt, 2010; Souleles, 2013). Gulf governments have established Western-modeled higher education institutions (Buckner, 2011; Weber, 2011) that emphasize 21st century skills (Bahrain Polytechnic, 2016; Zayed University, 2016). However, for Gulf higher education students, Western curricula and pedagogy may be misaligned with their academic culture (Gallagher, 2011; Hatherley-Greene, 2014) and Arab-Islamic epistemology which tend to favour a passive, rote-memorization approach to learning (Brownie et al., 2015; Diallo, 2014; Khelifa, 2009; Lemke-Westcott & Johnson, 2013; Syed, 2003). This misalignment leads to challenges in the development of skills such as information literacy for engagement in the knowledge economy (Chen & Dahlman, 2005; Johnston, Partridge, & Hughes, 2014; Martin et al., 2010; Ridge, 2014).

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Findings from a recent Gulf-wide survey in Spring, 2016 as part of the current study, along with extant theoretical and empirical literature, provide insights into the unique social, linguistic, cultural, and cognitive transitions that Gulf learners encounter when they enter Western-modeled higher education institutions, a process Hatherley-Greene (2014) describes as a cultural border crossing. At a very practical level, Gulf learners' limited information literacy skills pose substantial challenges to navigating the educational aspects of this novel environment (Martin, 2016) which is becoming increasingly reliant on skilled access and use of the World Wide Web (Brand-Gruwel, Wopereis, & Vermetten, 2005; Saunders, 2012). Specific barriers to students' development of information literacy may be related to the academic culture that they acquire in government K-12 and Arab-Islamic environments. The socio-cultural construct "academic culture" encompasses a learner's way of interacting, language, and tool use (Gee, 2008). For Gulf learners, this is reflected, respectively, in their passive learning approach (Diallo, 2014; Souleles, 2013), low English language skills (Belhiah & Elhami, 2015; McLean, Murdoch-Eaton, & Shaban, 2013), and limited global affairs background knowledge, information literacy skills, and experience with library and information and communications technology (ICT) tools (Johnston, Mavodza, & Jirjees, 2015; Khelifa, 2009; Wiseman et al., 2014).

At the same time, survey results reveal academic staff's own reported weaknesses in the pedagogical and technical skills related to information literacy, and indicate that their instructional approaches become less student-centred and more teacher-centred in *Gulf* higher education environments. Together - learners' passive approach to learning and academic staff's tendency towards teacher-centred pedagogy in the Gulf - represent



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barriers to the development of the multi-faceted competencies of information literacy schema and skills, and the readiness for active engagement in the Gulf knowledge economy. At the same time, there is an opportunity for an intervention that works with these preferences for and tendencies towards a more teacher-led learning environment.

### **The Intervention**

Example-based learning (EBL) supports students at their early, or novice, cognitive development stages of schema building and skills development primarily through direct instruction followed by scaffolding with worked examples (Renkl, Hilbert, & Schworm, 2009; Renkl, 2011; van Gog & Rummel, 2010). The main purpose of the study is to facilitate development of the initial skills and schema associated with information problem solving (IPS) (Brand-Gruwel et al., 2009) by implementing Renkl's (2014) instructionally oriented theory of example-based learning (EBL). The secondary purpose is to gather proof of concept for Gulf academic staff of transitioning from a teacher-led to student-centred approach using EBL.

The intervention was implemented with five all-female class sections of an introductory course on scientific research in the fall 2017 semester at a Middle East Higher Education Institution (MEHEI). A total of 119 students completed the course, and 106 consented to participate in the study. This mixed methods study followed an embedded design combining qualitative data collection and analysis within a traditional quantitative research design (Creswell & Plano Clark, 2011), in this case a regular pre-test / post-test experiment with three conditions. The treatments consisted of two different EBL orienting activities, self-explanation and explanation-help, while the control group received no treatment.

## **Findings**

Performance and perception data related to information problem-solving schema, skills, and behaviour were analyzed using descriptive and inferential (*t*-tests, ANOVA, ANCOVA) statistics. Findings indicate significant improvements in performance of IPS skill one - define the problem – by the two treatment groups at retention, and the explanation-help group significantly outperformed the self-explanation group on the same skill immediately following both post-tests but not at retention. Results also suggest significant main effects for the EBL treatment and English language proficiency, and no significant difference between the two treatment groups at retention. Participants' assessment of the training was positive, and overall, the explanation-help group ratings for both usefulness and difficulty of the training were the highest, though not significantly. Empirical research indicates that explanation-help scaffolds are well-suited when students are not yet able to fully or accurately explain the learning domain principles. The results provide support for the role of worked examples to support schema and skill development for novices, and emerging proof of concept for the use of EBL to transition from teacher-centred to student-centred with worked example scaffolds.

## **Chapter One: Background**

Higher education students in the Gulf Cooperative Council (GCC) (Arabian/Persian Gulf, or Gulf) face barriers to careers that require 21st century competencies such as information literacy (IL) (Bendriss, Saliba, & Birch, 2015; Martin, Birks, & Hunt, 2010; Souleles, 2013). In the six Gulf countries, Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates (UAE), 21st century competencies have steadily gained prominence and priority as part of the strategic efforts to transition from economies dependent on oil revenues to diversified economies based on knowledge (Buckner, 2011; Chapman, Austin, Farah, Wilson, & Ridge, 2014; Ewers, 2013; Weber, 2011). These transitions have not met with broad success (Ewers, 2013; Parcero & Ryan, 2016) despite the growing presence of Western-modeled higher education institutions (Buckner, 2011; Weber, 2011) that emphasize 21st century skills, a graduate or learning outcome (Bahrain Polytechnic, 2016; Higher Colleges of Technology, (HCT), 2016; Zayed University, 2016). Western-trained academic staff indigenize academic systems and other programs for the Gulf environment often by reducing and simplifying curricular content (Aydarova, 2012; Sonleitner & Khelifa, 2005), largely without systematic oversight (O'Sullivan, 2015) or informed consideration of the local culture (Aydarova, 2012; Diallo, 2014; Hamdan, 2014; Khelifa, 2009; Noori & Anderson, 2013; Sonleitner & Khelifa, 2005). In addition, for Gulf higher education students, Western curricula and pedagogy may be misaligned with their academic culture (Gallagher, 2011; Hatherley-Greene, 2014) and Arab-Islamic epistemology (Brownie et al., 2015; Diallo, 2014; Khelifa, 2009; Lemke-Westcott & Johnson, 2013; Syed, 2003) leading to challenges in the development of

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skills such as information literacy (N. Johnston, Partridge, & Hughes, 2014; Martin et al., 2010; Ridge, 2014).

Factors that contribute to these challenges exist on a broad economic and socio-cultural scale. Researchers and historians characterize underlying efforts to modernize the economy as leapfrogging (Hvidt, 2015) from more primitive commercial economies into a knowledge economy. At the same time, socio-cultural and educational research findings suggest a substantial gap between indigenous education practices in Gulf K-12 education systems and Western-modeled higher education environments (Gallagher, 2011; Hatherley-Greene, 2014; Lightfoot, 2015). Peter Hatherley-Greene's (2014) experience as an instructor (over 14 years) and researcher in the current study context led to his characterization of students' transition across this gap, from Arab-Islamic schooling to Western, globalized higher education, as a cultural border crossing. Together, the leapfrog and cultural border crossing metaphors reflect complex underlying anthropological and social issues. At the same time, the growing momentum and support for building a knowledge economy suggests opportunities to consider a different metaphor, to bridge rather than to leapfrog, across the cultural border. Information literacy and its requisite schema and skills for information problem-solving may be one such bridge.

Not only has information literacy (IL) emerged as a requisite competency for engagement in the knowledge economy (D. H. Chen & Dahlman, 2005), but the United Nations Educational, Scientific and Cultural Organization (UNESCO) has declared information literacy to be a basic human right and beacon of the information society, empowering people "to achieve their personal, social, occupational and educational

goals” (United Nations Educational, Scientific and Cultural Organization (UNESCO), 2016). Bridging Gulf learners’ IL skills gap requires an investigation of contributing factors of, or barriers to, IL development.

### **Factors Contributing to Gulf Students’ Information Literacy Skills Gaps**

#### **GCC: Knowledge Transfer, Localization, or Production?**

Growth and development occur when knowledge, an intangible asset, is produced, distributed, and utilized (Abduljawad, 2015), and the United Nations Development Programme (UNDP) has identified the higher education sector as a crucial development institution in the knowledge economy (Nour, 2011; United Nations Development Programme / Regional Bureau for Arab States (UNDP/RBAS), 2014). This sector, according to the UNDP, initiates, accelerates, and sustains economic growth through output of work-ready graduates (Hajjar et al., 2014; Nour, 2011; UNDP/RBAS, 2014). In the GCC, however, employers report a gap between their requirements and expectations, and their satisfaction with the quality of graduates (Ashour & Fatima, 2016; Hijazi, Zoubeidi, Abdalla, Al-Waqfi, & Harb, 2008; Kosior, Barth, Gremm, Mainka, & Stock, 2015; Wiseman, Alromi, & Alshumrani, 2014) which has led to an unrelenting regional reliance on expatriate labourers and knowledge workers for their expertise and skills (Ewers, 2013; Forstenlechner, Selim, Baruch, & Madi, 2014; Randeree, 2012; Sidani & Al Ariss, 2014). The private sector in the UAE, for example, employs very few Emiratis, with estimates of between 0.5% and 1.3% representation, (Austin, Chapman, Farah, Wilson, & Ridge, 2014; Forstenlechner et al., 2014) alongside 13% unemployment overall, and 23.1% for young Emiratis, aged 15-24 years (Barnett, Malcolm, & Toledo, 2015; Shaheen, 2011). These data suggest that concerted, aggressive efforts across the

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region to set and enforce quotas and other nationalization strategies (Ewers, 2013; Forstenlechner et al., 2014) alongside higher education programs have not had significant impact on the gap between employer needs and graduate capacities. For this reason, Gulf employers have looked to foreign sources of human capital to fill the gap.

Reliance on expatriate workers has been a common theme in the recent histories of employment sectors in Gulf countries. This is largely due to human capital needs triggered by the economic booms of the pearling trades in the earlier half of the 21st century, and by the petroleum industries in the 1960s (Davidson, 2012; Ewers, 2015). As an illustrative contrast with the West, Hvidt, (2015) describes Europe's progression into a knowledge economy, a process emerging from the gradual replacement of its agricultural foundation by industrialization, which in turn gave way to the information society - now being redefined and supplanted by a knowledge economy. Gulf countries, on the other hand, are not engaged in significant levels of inventing or innovating and, Hvidt (2015) claims, "are in essence attempting to leapfrog directly from a pearling / fishing / trading economy into a knowledge economy" (p. 24) by importing the requisite technology, expertise, and labour from external sources. Amid troubling and persistent unemployment challenges, recent fluctuations in oil prices, and socio-political pressures associated with the Arab Spring, there is an increasingly pressing need for training and development of Gulf citizens to become active agents and drivers of an emerging Gulf knowledge economy (Barnett et al., 2015; Ennis, 2015; Ewers, 2013).

Information literacy, deemed an essential skill for engagement in the global knowledge economy by the World Bank (D. H. Chen & Dahlman, 2005) and others (B.

Johnston & Webber, 2003; Lloyd, 2003), may represent a natural and fruitful focal point for this training and development of Gulf graduates. As Chapman et al., (2014) note,

[a]cross much of the Middle East, [g]overnment leaders have recognized that higher education is an important ingredient in the economic and social development of their countries... [and] that the globalization of markets, the interdependency of international financial systems, the expanded role of technology, and high speed communications have created an enormous need for highly skilled technical, professional, and managerial leaders. (p. 132)

### **The Role of Western-modeled Higher Education**

In higher education, the external source of the building blocks of the knowledge economy is, by and large, the Western trained professionals including academic staff in higher education institutions. The American university model has dominated the Gulf higher education component of regional social and economic development efforts which have focused on establishing local campuses of Western universities or patterning national universities on Western prototypes (Aydarova, 2012; Badry & Willoughby, 2016; Mazawi, 2003; Noori & Anderson, 2013; Prowse, 2014; Webb, 2008). An example of this is the purpose-built concentrations of satellite or branch campuses known as knowledge cities found in several major urban centres in the Gulf (Kosior et al., 2015; McHarg, 2015). Both administration and implementation of these campuses and models are conducted predominantly in the medium of English (Findlow, 2006; O'Neill, 2014; Webb, 2008) and overseen largely by expatriate professionals (O'Sullivan, 2015).

In recent decades, Western-educated expatriates have taken the lead as the main sources of academic staff for the Gulf region, a position previously dominated by

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Egyptian and other Arab expatriates since the late 1980s (Mazawi, 2008). Foreign professionals, trained at Western, principally American and British universities, take up the majority of positions of responsibility for oversight of the systems, as well as for implementation of Western education at the program and classroom levels (Austin et al., 2014; Khelifa, 2009; Lemke-Westcott & Johnson, 2013; Sonleitner & Khelifa, 2005). Given that institutions of higher learning hold the “distinctive status... as important national symbols that play a vital role in the propagation of a distinct national identity” (Webb, 2008, p. 375), the strong, multi-level Western presence in Gulf higher education represents a significant source of concern about the impact on social and cultural values and heritage preservation, including its effect on the official regional language, Arabic (Diallo, 2014; Findlow, 2006). Findings from studies by Belhiah and Elhami (2015), Diallo (2014), Findlow (2006), and O'Neill (2014) indicate that, in higher education settings, Gulf students' academic and cultural identities undergo substantial adaptations and changes, however neither the phenomenon nor the concern is limited to the Gulf region. With an eye towards preparing graduates for the knowledge economy, international higher education institutions are taking on roles of increasingly transnational significance in a networked, globalized system, rather than of national institutions or guardians of national culture (Starrett, 2008; van den Hoven, 2014).

**Knowledge transfer: Precedence.** In the broader Middle Eastern context, Starrett (2008) traces the conflict of education roles between practical capacity building and cultural heritage preservation back to the turn of the 20<sup>th</sup> century. At that time, regional leaders viewed formal Western education as a vehicle to pursue social and political objectives (Starrett, 2008) as education in the Arabian Gulf was limited largely to



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informal settings where religious men, or *imams*, taught young males using a memorization style rote-learning approach based almost entirely on the Koran (Davidson, 2010; Ridge, 2014). Most imams were illiterate and “therefore unlikely to be able to teach any of the boys how to write or to comprehend rudimentary mathematics” (Davidson, 2010, p. 61). This approach to teaching and learning, a dominant and recurring factor in the current study and discussed below, remains dominant in government (public) school systems across the region where overall quality is perceived to be significantly lower compared to private school offerings of British, American, International Baccalaureate, and other curricula (McLean, Murdoch-Eaton, & Shaban, 2013; Ridge, Shami, & Kippels, 2016). The latter systems generally use more modern, learner-centred teaching approaches in the medium of English and thus attract a significant portion of Gulf nationals who can afford it (Gallagher, 2011; Hatherley-Greene, 2012; Walters, Kadragic, & Walters, 2006).

Later in the 20th century, as increased commercial activity in the Gulf region brought financial resources, various wealthy patrons (including royal families, or *sheikhdoms*) began to invest in schools with broader-based curricula, including math, geography, local and European history, and Islamic law and science - taught by Arab expatriates or local men educated in the Arab world (Davidson, 2010; Davidson, 2012; Ridge, 2014). Ridge (2014) notes that literacy rates in the Gulf fluctuated during this period, and access for girls remained a problem until equal access for males and females was granted and Western-style mass schooling was established in the early 1970s. In terms of staffing, Gulf females have increasingly undertaken teacher training and certification and have begun to replace their expatriate counterparts, while men have

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largely opted out of the teaching profession due to more lucrative career options and social pressure to take on professional roles perceived to be more prestigious (Dickson & LeRoux, 2012; Dickson, 2013; Ridge, 2014; Ridge et al., 2016). As a result, public boys' schools remain staffed by Arab male expatriates mainly from Syria, Jordan, Egypt, and Palestine (Dickson & LeRoux, 2012; Ridge, 2014).

Given the historical pattern of foreign educators in the region and the role of universities in preserving and shaping national culture, the ongoing tensions between capacity building and cultural preservation are not surprising. As with kindergarten through grade 12 (K-12) education, where nationals are represented primarily by female teachers, there are few academic staff in higher education who are local citizens due to the relative scarcity of qualified Gulf nationals (Austin et al., 2014; Dickson & LeRoux, 2012; Kirk & Napier, 2009; Ridge, 2014). Moreover, although Arabs from the Middle Eastern region and beyond are well-represented among academic staff in Gulf higher education, Abouchedid (2006) argues that because of the overwhelming reliance on Western models of education, “Arab researchers function... as mere translators of Western epistemology, which is imported from the West, repackaged and delivered to the Arab information consumer” (p. 2).

### **Why Knowledge Transfer is Not Enough**

A core aspect of economic development lies in the nature of the exchange of knowledge which, according to the UNDP, has always been at the core of human interaction “including the Arab region during the flowering of the Islamic civilization” (2014, p. 39). Importantly, though, exchange does not equal localization. On the one hand, the notion and act of transfer commodifies knowledge and involves an exchange

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much like goods and services, while localization, on the other hand, entails internally producing and employing knowledge (UNDP/RBAS, 2014). Research indicates that higher education in the Gulf region is currently engaged more in transfer, or exchange, rather than localization of knowledge (Abouchedid & Abdelnour, 2015; Donn & Al Manthri, 2013). Rather than simply acquiring knowledge through an exchange, localizing knowledge is more profound in its developmental and capacity building nature.

Discussions of knowledge transfer in higher education in the six Gulf countries raise two issues, the commodification of knowledge and limitations or constraints regarding its production. To illustrate the former, Buckner (2011) describes the acquisitive, externally sourced nature of higher education development in the Gulf as imported internationalization, and argues that the primary role of Western universities is not as much to prepare Gulf students for the knowledge economy, but to establish international prestige and recognition for the Gulf countries. Similarly, Davidson (2010) cites an emphasis on more surface level aspects of knowledge transfer over substance and quality:

Lavish constructions and big budgets have ensured a pleasant educational environment and good resources for learning. However, there is a question mark over the enforcement of minimum standards. Although there are exceptions, in most cases ministries have been slow to develop quality control bodies to monitor curriculum development and teaching practices. Moreover, as of yet there are no effective measures of research output or quality. Research grants are easily won, but then there is rarely any follow up, with few requirements on the researcher to work towards a tangible output. (p. 69)

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Currently, as oil prices drop and regional instability rises, resources devoted to knowledge production, including research and other scholarly or innovative endeavours, are scarce. Research by Abouchedid and Abdelnour (2015) and Romanowski and Nasser (2015) suggests a paradox in Gulf higher education institutions with unprecedented recruitment levels of academic staff “nurtured in Western Anglo-American” environments characterized by the “liberal tradition of open and diverse thinking” into environments that “lack a genuine and academic culture... [and hold] strong ideological and political currents that limit any space for free thinking” (Romanowski & Nasser, 2015, p. 654). Scholarship and innovation, then, two crucial components of knowledge localization and production, can be constrained by serious impediments such as limits on academic freedom and security (Abouchedid, 2006; Abouchedid & Abdelnour, 2015; Romanowski & Nasser, 2015). These challenges are echoed by Donn and Al Manthri (2013), who point to the wider phenomenon of the commodification of higher education globally in support of a neoliberal market approach. In this marketplace, they argue, Arab Gulf States engage in “consumption, not ... production” of knowledge through a form of “McDonaldisation” (Donn & Al Manthri, 2013, p. 156) of education products such as courses and qualifications. Decrying these conditions of knowledge transfer, the authors call for “capacity building, knowledge generation and [a] culture of imaginative ideas” (p. 159) to establish knowledge localization. This perspective of the impact of Western education systems leading to cultural replacement rather than simply policy borrowing (Donn & Al Manthri, 2013) is not limited to comparative education scholars but instead reflects commonly held fears within school systems.

### **Transferring Western Models: A Process of Indigenization**

**Institutional level.** To allay concerns about the impact of Western English-medium curricula on local culture and the Arabic language, academic staff make efforts to indigenize the transferred models in national higher education settings at institutional, program, and classroom levels. Indigenization, also termed domestication, occurs when external features of another model or system are absorbed and ultimately synthesized into the strategy or regular practice of the borrower country (Phillips & Ochs, 2004). In the case of Gulf nations, this far-reaching process of enormous impact generally occurs in the absence of systematic oversight (Aydarova, 2012; Belhiah & Elhami, 2015; Chapman et al., 2014; Davidson, 2010; Webb, 2008). Aydarova's studies (2012, 2013) of the cross-national transfer of teacher training models offer insights into the phenomenon of indigenization. Utilizing a four-stage policy transfer framework from Phillips and Ochs (2003, 2004), Aydarova (2012) explains that the cycle begins with cross-national attraction to solve a national education problem followed by decision-making to borrow a policy, and a third stage, initiating its implementation. Indigenization is the fourth and final stage, where "the policy becomes internalized ... [whereby it] assimilates local features and is considered a local creation" (Aydarova, 2012, p. 286). This phase highlights potential for local socio-cultural considerations and indigenous content to be assimilated in the structure of the borrowed program or system, which could address apprehension regarding its short- and long-term impact. At the institutional level, research suggests that indigenization of Western education systems in the Gulf may validate this apprehension (Aydarova, 2012; Belhiah & Elhami, 2015; Chapman et al., 2014; Diallo, 2014; Hamdan, 2014; Hatherley-Greene, 2014; Webb, 2008).

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To illustrate, although administrators and faculty in higher education institutions are reported to be under constant scrutiny by visiting accreditation agencies (Mazawi, 2003), the accreditors do not consider themselves regulatory agents, as evidenced by their narrow jurisdiction over curricular matters with neither prescriptive nor supervisory roles (Dickson, 2012; Kelly, 2011; Noori & Anderson, 2013). Kelly (2011) reports that even though the higher education institution in her study is named *American University of Kuwait*, it

is not governed and consequently does not function like institutions of higher education in the US... [which] means in practice ... regular negotiations between American and Kuwaiti understandings of ... standards and role in society [result in] ongoing compromise between American expectations and Kuwaiti realities. (p. 203)

In addition, due to what Hamdan (2014) describes as excessively high turnover rates for expatriate administrators and faculty, organizational systems and practices can change easily (O’Sullivan, 2015), which indicates the absence, in some cases, of both systematic oversight and consistent staffing, further impeding and destabilizing the indigenization processes.

To illustrate at the institutional level, Aydarova’s (2012) study explores the transfer of teacher training curricula from non-Arab sources (America and Singapore) into two teacher training college systems in the United Arab Emirates. Qualitative data from the indigenization stage of the study reveal ethnocentric decision making by expatriate administrators and faculty whereby contextualization of content is superficial at best because

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most of the faculty come from the West ... [and] are more likely to adopt Western textbooks. Adapting those for the local situation involves placing the burden of making connections between the American text and the local context on the students. (Aydarova, 2012, p. 290)

In a later international study of transnational flows of education reforms and the impact of globalization on teacher education, Aydarova (2013) echoes Donn and Al Manthri (2013) when she characterizes this phenomenon as a threat to the vitality of local cultures, contending that “local foundations of morality and spirituality are lost with each new generation of teachers” (p. 179). Additional evidence for this concern lies, for example, in Aydarova’s (2012) UAE teacher training study where explicitly stated aims to localize were negligibly represented in the curriculum and structure of both teacher training colleges. While Islamic civilization and Arab concepts and literacy were added to the curriculum, it was highly circumscribed with only four of 42 (9%) courses incorporating elements of the local culture. In contrast, and of even greater concern, Webb’s (2008) comparative study of American ( $n = 14$ ) and other English-medium ( $n = 8$ ) universities in the Arabian Gulf found that Islamic studies make up only 2.14% of the humanities and social sciences course offerings in the sample from Gulf higher education institutions in five of the six Gulf countries (Bahrain not represented) - a seven percent deficit compared to Aydarova’s (2012) findings.

Rather than taking an ethnocentric stance, Webb (2008) explains this finding from a practical perspective. First, citing the region-wide priority to address Gulf students’ communication needs, he notes that because students are taught and assessed in a foreign language, English, considerable language support is required, especially in the early years

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of their higher education studies. This priority may take precedence over courses directly related to the local culture. Second, in higher education institutions in the West, concerns for students' cultural and social literacy are addressed through humanities and social science offerings such as history, literature, and ethics (Webb, 2008). Conversely, in the Gulf, Webb explains, "promotion of social norms and moral values is more often the preserve of family, tribal and religious institutions" (2008, p. 372). As such, higher education institutions meet ministry demands through required courses on Islam, but devote humanities and social sciences resources to developing students' language and overall communication skills (Webb, 2008).

**Classroom levels.** Beyond institutional contexts, indigenization of Western models also occurs at the Gulf higher education institution classroom level, and research indicates that academic staff adjustments to curriculum and pedagogy may vary widely according to their own interpretations of local culture and learners' needs. Empirical studies in Qatar (Lemke-Westcott & Johnson, 2013; Prowse and Goddard, 2010), Saudi Arabia (Hamdan, 2014) and the UAE (Hatherley-Greene, 2014; Saudelli, 2012) suggest that when academic staff more carefully consider students' personal, cultural, learning, and epistemological backgrounds, there is greater reported student engagement and motivation. Results from Saudelli's (2012) research in the UAE, for example, found that faculty who incorporate learners' customs and traditions into classroom discussions and activities report that students respond positively through more active engagement in their learning. Similarly, findings from both Hatherley-Greene (2014) and Lemke-Westcott and Johnson (2013) illustrate the importance of personal relationship-building in Gulf society as it manifests in the classroom between faculty and students. Student evaluation



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data in Hatherley-Greene's (2014) study indicate that those instructors deemed *warmly demanding* received the highest rapport scores, while those who were *demanding without warmth* were rated the lowest. Likewise, student respondents in Lemke-Westcott and Johnson's (2013) study singled out the role of teachers in facilitating students' often difficult transition from high school to a new learning environment, citing, in particular, the importance of interpersonal relationship building. Qualitative data are consistent with the view that, if the teacher is deemed nice, students will learn well, and the opposite if they are not (Lemke-Westcott & Johnson, 2013).

Faculty recognition and understanding of students' heritage and prior learning in didactic, rote-learning, memorization-heavy school environments has also been found to positively impact teaching and learning. Findings from Prowse and Goddard's (2010) study of Canadian faculty pedagogical adjustments in a Canadian satellite college in Qatar suggest that the changes were driven by their perceptions of students' culture. For example, the cultural dimension of power distance framed faculty's awareness of the reluctance to interrupt the teacher, or to contribute to a discussion. Instead, students waited to be called upon, and to the Western (Canadian) study participants, this seemingly passive approach to learning in higher education can potentially be misunderstood as lack of interest or engagement (Prowse & Goddard, 2010). The researchers report that participants in the study made adjustments to their pedagogy that included a gradual progression from a highly structured, teacher-centred approach to one characterized by varied activities and more independent learning (Prowse & Goddard, 2010). This emphasis on pedagogy instead of content reflects a commitment to maintaining standards from the main campus in Canada.

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Knowledge or awareness of students' backgrounds may ease discord in the teacher-student dyad, however it is not a guarantee of concord or harmony. Research from higher education institutions in Kuwait, Qatar, the UAE, and Saudi Arabia reflect this delicate balance. Kelly's (2011) exploration of a Western higher education institution in Kuwait, for instance, found that, by and large, faculty seemed to be sufficiently aware of cultural and legal restrictions, such as criticizing the country's leaders. Nonetheless, misunderstandings of off-handed comments persist as sources of conflict between students and academic staff, with some resulting in formal complaints by students or even their parents (Kelly, 2011). Indeed, in his seminal article on English language teaching in the Arabian Gulf states, Syed (2003) points out that there is an overwhelming presence of expatriate teachers at the tertiary level who are from Anglophone backgrounds and, "although [these] foreign teachers bring diversity into the classroom... and some use contextually situated pedagogy, there are wide gaps in the expatriate educators' (especially non-Arabs') knowledge of local sociocultural communities" (pp. 338-339). This observation remains valid fifteen years on. As discussed below, recent empirical studies of faculty considerations of cultural norms and beliefs in the Gulf higher education classroom indicate that missteps remain, but are also mitigated by reflective consideration and practice.

Faculty awareness of the delicate balance between the drive to globalize education amid efforts to preserve and respect the local culture is evident in Romanowski and Nasser's (2011) investigation of the level of critical thinking in a Qatari higher education institution. The authors found that "questioning of societal, economic, judicial or cultural issues can be considered as a direct criticism of religious traditions" (p. 127). As an

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example, one participant described a small party to celebrate Easter to illustrate her school's vision of open-mindedness and appreciation of diversity, then added that she was not allowed to explain the meaning of this significant Christian holiday (Romanowski & Nasser's, 2011). This suggests faculty awareness of potential negative repercussions associated with discussing foreign religious traditions in the classroom alongside a willingness to engage in more inter-personal relationship building, noted earlier as a positive influence on student engagement.

In Diallo's (2014) phenomenographic study at a UAE higher education institution, students resisted both Western-themed materials and expatriate instructor-led discussions. Students' resistance to content in Western textbooks manifested through modifications of images (e.g., adding a beard or head scarf) and expressions of displeasure with what they perceived as inappropriateness of images or topics. Some students stated a preference for literature and other content or genres related to their own culture, for example poetry, and for topics including Islam that they felt were more serious. These data offer compelling insights into Gulf higher education classroom interactions touching on politics, gender, and other sensitive topics. The examples also underscore students' discomfort and tension with these subjects, which can lead, in some cases, to the teachers' dismissal and students' perception of expatriate educators as covert agents of Western culture (Diallo, 2014).

Like Diallo (2014), Hamdan (2014) found a dominance of Western themes and study materials in Saudi Arabian higher education classrooms, and a scarcity (or absence) of content of cultural relevance to the students. This, she argues, resulted in students' limited engagement in learning, as Western professors lacked the necessary training and

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access to mentoring to indigenize their content from a multicultural perspective and to adjust their teaching practice accordingly (Hamdan, 2014). In this longitudinal study, analysis of artefacts, faculty comments, and the researcher's own observations indicate that academic staff, with few exceptions, struggled to understand their students' preferred learning methods and culture, as well as challenges they may face learning from expatriate teachers (Hamdan, 2014).

**Curriculum level.** Importantly, beyond socio-cultural concerns at the institutional and classroom levels, empirical findings suggest a troubling or negative impact of individualized, or non-systematic, indigenization on learning and curriculum quality overall. Instead of enriching the curriculum through the infusion of local content and maintaining curriculum standards, the indigenization process in several cases has involved trimming content deemed by faculty as potentially controversial. Aydarova's (2012) and other research data depict multiple instances across various Gulf higher education settings of academic staff cutting large portions of curricular objectives and extensive simplification - termed *dumbing down* by one respondent - all on an individual basis (Aydarova, 2012; Khelifa, 2009; Sonleitner & Khelifa, 2005).

These findings suggest that expatriate educators adjust pedagogy and curricula independently and non-systematically with limited understanding of the background and needs of Gulf Arab students, especially those from government K-12 schools. Studies of anthropological and sociocultural traits of Gulf government school learners offer insights into their academic culture developed at school which, according to Gee (2008), interacts significantly with students' vernacular cultures, formed largely through socialization early in life.

## **Vernacular and Academic Culture**

**Anthropological and sociological lenses.** Socio-cultural perspectives provide a rich description of students' vernacular and academic cultures. Three anthropological factors, polygamy, consanguinity, and tribalism, are particularly important to understanding Gulf students' culture. Polygamy, estimated at 13% and higher (Al-Krenawi & Graham, 2006) impacts Gulf students' psychological health, academic performance, and family function, as indicated, for example, in adolescents' low self-esteem, weak academic performance, and greater levels of self-reported family dysfunction (Al-Krenawi, Graham, & Slonim-Nevo, 2002). Further, anecdotal evidence indicates that having students who are half-siblings (same father) from polygamous marriages in the same classroom can cause enormous tensions, including resistance to participating in collaborative activities together or even discussions. In addition, the incidence of consanguineous or first-cousin marriages in Arabian Gulf countries ranges from 22.5 - 64.3% in Kuwait, to 42.1 - 66.7% in Saudi Arabia (Tadmouri et al., 2009). Studies comparing students from monogamous and polygamous marriages found that the genetic component of inbreeding depression has a negative effect on children's reading, verbal, performance, and full intellectual skills (Abu-Rabia & Maroun, 2005; Fareed & Afzal, 2014). Finally, the predominant tribal culture of the region (Abdalla & Al-Homoud, 2001) impacts both relationships and epistemology. Authority is centralized under tribal leaders, leading to autocratic management tendencies and underdeveloped collaborative skills with those outside the in-group (Neal, Catana, Finlay, & Catana, 2007). In addition, research indicates that Gulf students tend to readily accept statements on scientific knowledge from authorities (Karabenick & Moosa, 2005), indicating the

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dominant role of authority. This suggests a common Arab epistemology in the development of vernacular and academic cultures.

The impact of polygamy and first-cousin marriage on affect, cognition, and academic achievement, along with the epistemological implications of tribalism, provide insights into the cultural factors impacting government school students' experience of both K-12 and higher education in the Gulf. A closer examination of sociological factors complements this emerging understanding. Specifically, Gulf Arab epistemology shares features of its Islamic counterpart, developed through a "schooling process [that] points toward Islam and its prophets as the ultimate guides for social values and power" (Wiseman & Alromi, 2003, p. 207). Religious creed influences learning to the extent that religious teachings and injunctions are neither alterable nor negotiable and "critical thinking and rational knowledge processing" are allowed only "as long as they do not contradict Islamic teachings" (Diallo, 2014, p. 4). At the same time, Gulf public school pedagogy has long been characterized as memorization- and repetition-based, facilitated by didactic, transmission-style teaching practice (Gallagher, 2011; Martin et al., 2010; Muysken & Nour, 2006; Sonleitner & Khelifa, 2005; Souleles, 2013). Bearing in mind the earlier description of the emphasis on memorization at the turn of the 20<sup>th</sup> century, given the religious teacher's illiteracy (Davidson, 2010), a Gulf government school academic culture seems to persist in K-12 environments today.

**Mismatched academic culture.** These findings from anthropological and sociological perspectives suggest a common Arab-Islamic epistemology derived through passive, rote-learning experiences in government education and religious communities, alongside development of an academic culture that may be incompatible with that of

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Western higher education, often characterized by active, participatory learning through constructivist or other learner centred approaches (AlAlami, Al-Saleh, & Rahal, 2013; Brownie et al., 2015; Minnis, 1999; Minnis, 2006; Souleles, 2013). When these two academic cultures meet in the higher education classroom, studies indicate discomfort and again, resistance based on the mismatch.

To illustrate, AlAlami et al.'s (2013) experiment with female higher education institution undergraduate participants in the UAE involved a lesson dominated by active, student-centred, self-directed learning with minimal teacher input. Results indicate that the students in the experimental group reported not only a significant ( $p < 0.05$ ) increase in moderate stress, but also presented increases in both heart rate - approaching a diagnosis of tachycardia - and blood pressure, well beyond the control group who had indicated preference for this approach (AlAlami et al., 2013). Findings from Brownie et al.'s (2015) study of UAE nursing students' perceptions of learning activities also indicate a preference for and comfort with a more teacher-centred, didactic approach, and that these Gulf learners overwhelmingly preferred to simply get the right answer during classroom activities. Participant comments indicate a resistance to more active-learning tasks where they examine complex scenarios and discern a variety of possible diagnoses through, for example, case study activities. Brownie et al.'s (2015) quantitative data also reflect a negative view of the teaching faculty based on their teaching approach (constructivist), and correlate with qualitative data from the focus groups, as well as the researchers' own observations and teaching experiences during the program implementation (Brownie et al., 2015).

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In addition to the role of Arab-Islamic epistemology, the Gulf government school academic culture, nurtured almost exclusively in Arabic (Findlow, 2006; Hatherley-Greene, 2014), plays a role in students' adjustment to the higher education context, where Western faculty incorporate critical thinking, active construction of knowledge, independent learning, and information literacy through English-medium instruction (Brownie et al., 2015; Findlow, 2006; Hatherley-Greene, 2014; Romanowski & Nasser, 2015; Souleles, 2013) and learning activities that engage a variety of both student- and teacher-centred approaches (Alalami et al., 2013; Brownie et al., 2015; Lemke-Westcott & Johnson, 2013). Transition into this environment can be described as a cultural border crossing, as described by Hatherley-Greene (2014). In this cultural transition, the process of developing a new academic culture in an unfamiliar involvement can affect Gulf learners' persistence in the institution, and stimulate disruptive, unsettling affective reactions characterized by confusion and alienation, resulting in withdrawing from higher education (Hatherley-Greene, 2014).

Thus far, the discussion of the Gulf's strategic transition towards a knowledge economy framed by economic, political, historical, social, anthropological, and socio-cultural factors portrays a complexity of systems in which Gulf Arab learners and Western-educated academic staff operate and interact. Higher education represents one such complex system, and represents a turning point in students' intellectual, or cognitive, development. It also represents a turning point in their academic information seeking approaches, both of which form the prerequisite skills and declarative and procedural knowledge of information literate behaviour (Rosman, Mayer, & Krampen, 2016a). To identify more specifically the barriers to this transition for Gulf higher



education institution graduates, the role and status of information literacy is considered, not least due to its status as a “meta-competency” or “the currency” of the knowledge economy (Lloyd, 2003, p. 87).

### **Information Literacy - Meeting the Needs of the Knowledge Economy**

An information literate person has the capacity to determine the kind of information needed, and to evaluate, use, communicate, and manage the information ethically and responsibly (American Library Association, 2016; Chartered Institute of Library and Information Professionals (CILIP), 2013; International Federation of Library Associations (IFLA), 2015). Not surprisingly, information literacy (IL) plays a central, pivotal role in knowledge economy engagement (Chen & Dahlman, 2005; UNESCO, 2016) and as noted earlier in the chapter, IL is woven into institutional learning and/or graduate outcomes in Gulf universities, colleges, and polytechnics, consistent with higher education institutions globally. As such, Johnston and Webber (2003) describe its “key relevance” to “the most significant economic and cultural activity,” demanding an educational response to meet the “scale and connectedness of the global information society” (p. 335). This clarion call has been articulated at the highest levels of government with His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President of the UAE, stating that this “information-intensive economy infiltrates all sectors...[and thus] requires a sustainable source of human talent, skills, and ideas that are appropriate to the demands of the labour market... cultivated and nurtured within institutions of higher learning” (Mohamed, 2014 p., 2). As would be expected, national and institutional supports in the Gulf region have prompted efforts to develop information literacy through, for example, expansions of library facilities and information and

communications technology (ICT) infrastructure in higher education institutions (Lightfoot, 2015; Wiseman & Anderson, 2012).

### **Information and Communications Technology and Information Literacy in Gulf Education**

**K-12 education.** In a recent study, Lightfoot (2015) examined the extent to which a Bahraini national education reform policy transformed curriculum and pedagogy in public K-12 education as a means to prepare students for technology-based employment and the knowledge economy. With a focus on the support (technical training, hardware/software service, professional development) and actual exploitation of ICT resources, Lightfoot found shortcomings in implementation rather than in resources. Results point to factors such as the emphasis on technical, operational training to the detriment (and absence) of a professional development (PD) focus on instructional exploitation of ICT. Findings indicate that this emphasis, and a dearth of service-oriented resources such as ICT technical support amid a prevalence of surveillance and monitoring of the Arab expatriate teachers, affected the implementation of ICT policies. Describing the policy implementation process as little more than hardware distribution, respondents referred to large number of malfunctioning or obsolete machines and teaching practices that have become even more teacher-centred and didactic in the push to put technology front and centre without pedagogical training. These results suggest more top-down implementation of education reform with an emphasis on knowledge (and technology) transfer rather than embedding support for capacity building and knowledge production. Research by Wiseman and Anderson (2012) and Martin et al. (2010) portray similar scenarios elsewhere in the Gulf.

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Wiseman and Anderson (2012) took a broader, Gulf-wide focus of the integration of ICT into education and innovation infrastructures. The authors found that expenditure on education and its infrastructure in the Gulf is weak and on par with developing countries, and in terms of education resources in general, Gulf students have fewer than their peers internationally. Paradoxically, the use of the Internet is much higher among Gulf individuals than their peers in developing countries and in some cases, in developed environments. In addition, as with Lightfoot's (2015) study, results indicate that, where ICT resources exist, teaching and learning remain much the same as the teacher-centred, rote-learning pre-ICT era. Although PD and training options exist in government schools, they tend to emphasize the technical operation and function of the software and hardware, rather than its integration with student learning, including critical thinking. A surprising but understandable finding linking the persistent importance of pedagogy was the negative relationship between computer use for instruction and science achievement. That is, when students report high levels of computer use in class as part of their learning, their achievement in science decreases significantly in every country (Wiseman & Anderson, 2012). This suggests that neither pedagogy nor learning improves with the mere introduction and use of technology.

**Higher education.** Wiseman and Anderson's (2012) findings are consistent with those of Lightfoot (2015) regarding the weak support for training in pedagogy and the resulting weak or negative impact from implementation strategies for ICT. While this research focused on the K-12 sector of government schools in the Gulf, many of the graduates of these schools enter higher education where faculty is tasked with building critical-thinking, information-literate graduates able to join the emerging knowledge

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economy. Martin et al. (2010) provide a retrospective view from this setting, this time in the UAE.

The survey-based study by Martin et al. (2010), who are academic librarians, assessed the value and relevance of an in-house online information literacy tutorial, with data and findings offering additional insights into government students' background and experience with technology and IL resources, including both online resources and school libraries (Martin et al., 2010). Results shed light on the challenges and deficient conditions related to information literacy particularly in government schools. For example, they report that the amount of private school graduates who used their high school library a lot was 13 times greater than government school students, and 76% of government school students reported not receiving instruction in IL, compared to 66% for private school graduates. Data also indicated that 81.5% of participants from public schools entered the university at the pre-baccalaureate level, requiring intensive remedial English instruction in the foundation, or preparatory, program. An equally high number, 81.6%, of respondents from private schools entered at either the highest (exit) level of the foundation program, or directly into first-year degree studies. Martin et al. refer also to institutional data that indicate that libraries have been mostly non-existent in public schools, which explains why most students lack prior experience with a variety of information resources, as evidenced by 75% of schools being stocked with only six or fewer books per student, and a negligible number of schools equipped with computers, Internet connections, or well-resourced library collections. These studies provide insights into Gulf K-12 and higher education environments and the policies, educators, technology, and libraries that are in place to support the development of information

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literacy skills development through technology and library. Widening the lens to incorporate a perspective of Gulf *student* information literacy behaviour and perceptions is a challenge, with few available empirical studies.

**Student information literacy behaviour.** To gather pre-med students' perceptions of a mandatory information literacy component of an English for Academic Purposes (EAP) course in Qatar, Bendriss et al. (2015) used focus group and survey methods. These data indicate student concern about their IL skills of evaluation of information, citation, and searching, however little detail or further discussion is provided. Similarly, Ashoor's (2005) study of the development of information literacy and library resources in a prominent Saudi University is hampered by weak validity and reliability due to its overemphasis on praise and promotion of the facilities and programs, rather than empirical data collection and analysis. Equally, Al-Muomen, Morris, & Maynard's (2012) research on Kuwaiti graduate students' IL behaviour is challenging to interpret due to its use of opaque terms and inconsistent language use (e.g., describing the role of English language proficiency under the heading 'culture'), as well as their discussion of structural or political factors (e.g., censorship, gender segregation) to explain information levels. Finally, although Belhiah and Elhami's (2015) study examined Emirati (UAE) student and faculty perceptions of the use of English as the medium of instruction, results regarding students' weak reading and English language skills and their over-reliance on the Google Translate tool to complete academic tasks suggest weak or limited academic competencies that directly affect information literacy development. Qualitative and quantitative data from both students and faculty indicate significant gaps in estimates of

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students' skill levels, with students reporting much higher levels than their instructors (Belhiah & Elhami, 2015).

These limitations in empirical research of information literacy from a student's perspective and the findings from earlier studies on the IL-related conditions Gulf K-12 and higher education institutions suggest the need for another perspective, higher education faculty. Academic staff perceptions related to IL in general as well as student information literacy specifically may impact the extent to which institutional and national information literacy goals are achieved.

### **Information Literacy - Academic Staff Perceptions and Experiences**

Development of information literacy involves multiple stakeholders in an iterative process enacted over time (Cannon, 1994; Hardesty, 1995; Head, 2008) yet IL research remains in its infancy, limited by an ill-defined agenda and the absence of theoretical frameworks (Bruce, 2011). Further, although both academic staff and librarians in higher education institutions play key roles in the iterative process of IL development, research specifically on the faculty perspective remains scarce overall, beyond reports thereof from librarians (Bury, 2011; McGuinness, 2006; Saunders, 2012). Empirical studies of IL beyond Western countries are even more limited. Protracted search efforts of IL research outside of Western environments yielded only four studies encompassing exploration of ten university and research libraries in China (Jabeen, Yun, Rafiq, Jabeen, & Tahir, 2014), a Malaysian university (Adikata & Anwar, 2006), a university library in Pakistan (Kashif, Hassan, & Hassan, 2011), and four Vietnamese universities (Kim Chi & Nahl, 2011). Given the current information- and knowledge-economy transition globally, information literacy in higher education, has become integral as part of the information

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problem-solving process to close information or knowledge gaps (Hensley, 2004; Kuhlthau, 2003; Small, Zakaria, & El-Figuigui, 2004).

Extensive research over three decades on the process of solving information problems has established the importance of constructivist, inquiry-based components of information literacy development in various settings and among myriad types of learners (Brand-Gruwel, Wopereis, & Vermetten, 2005; Brand-Gruwel et al., 2009; Eisenberg & Berkowitz, 1992; Eisenberg & Johnson, 2002; Kracker, 2002; Kuhlthau, Heinstrom, & Todd, 2008; Kuhlthau, Maniotes, & Caspari, 2015; Matteson, 2014). The challenge remains, however, that a more learner-centred approach that engages Gulf learners in inquiry and questioning of information sources in the active construction of knowledge is likely to meet with resistance among learners of Arab-Islamic epistemology background, as discussed earlier. Research suggests that Gulf learners from government K-12 education backgrounds experience discomfort (AlAlami et al., 2013; Souleles, 2013) and express opposition or resistance (Brownie et al., 2015; Diallo, 2014) when faced with active learning and knowledge construction, which adds to the perception of a gap or mismatch between Western-trained Gulf academic staff and government school Arab-Islamic Gulf learners in higher education. That is, in a region strategically working towards building a knowledge economy staffed by information literate citizens who are work-ready and able to fully engage in information problem-solving, the role of Western-trained academic staff in Gulf higher education institutions is crucial in closing the gap and minimizing the mismatch. As such, their perceptions, experience, and pedagogy associated with student information literacy development are equally crucial. Research on

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this group with a specific information literacy focus and in the Gulf higher education context is non-existent.

### **Summary of Factors Affecting Information Literacy Development**

Information literacy involves a level of engagement in solving information problems that incorporates active, construction of knowledge, as well as exploration and discovery (Grossnickle, 2016; Noordewier & van Dijk, 2015). In GCC countries, higher education students, especially those from government school K-12 backgrounds, face challenges in developing information literacy knowledge, skills, and dispositions to enter careers in the emerging knowledge economy. At the same time, Western-trained academic staff simplify and reduce Western curricula, and in some cases, have limited understanding of their students' vernacular and academic cultures. Student development of information literacy may be affected by this gap in understanding as well as the indigenization process and its associated adjustments to pedagogy at the institutional level. Empirical research and findings from preliminary, informal observations and unstructured interviews indicate that faculty perceptions of information literacy and student academic skills (Al-Muomen, Morris, & Maynard, 2012; Belhiah & Elhami, 2015) may impact student information literacy development. The cultural border crossing in Gulf higher education, described by Hatherley-Greene (2014), appears to be relevant to understanding these challenges and gaps experienced by students and academic staff alike. Given the limited availability of empirical research in these areas, a need to investigate of perceptions of Gulf higher education academic staff has emerged.



## **Chapter Two: Needs Assessment Study**

### **Context**

In the spring, 2016 academic semester, academic staff in higher education institutions in the Arabian/Persian Gulf countries, Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates, completed an online survey and contributed their perceptions, current experiences, and teaching and learning background of information literacy. Findings from the survey and from peer-reviewed literature informed the intervention to address relevant factors associated with Gulf learners' challenges in developing information literacy. The purpose, design, participants, and results of the investigation are described below.

### **Purpose of Study**

This descriptive, exploratory study of Gulf higher education academic staff perceptions and pedagogical approaches aimed to identify factors that may impact the development of student information literacy. Participants are academic staff - teaching faculty and staff in libraries, writing centres, and academic support units - in post-secondary colleges, universities, vocational training institutes, and polytechnics in the six Gulf countries. The study elicited participants' views of factors that may affect student development of information literacy. Participants also rated students' and their own level of ability, awareness, and importance of IL in general, as well as of the five IL components, *determining the kind of information needed, evaluating information and its sources, using / communicating information effectively, understanding the ethics of use, and managing (organizing, storing) information*. Additionally, the study examined

respondents' pedagogical approaches (teacher- versus learner-centred) and resources associated with information literacy teaching and assessment.

## Method

### Research Design

**Participants.** Respondents ( $N = 204$ ) are academic staff in Gulf higher education institutions who teach, assist, advise, and/or guide learners in the classroom, library, and academic support centres. Curriculum and assessment developers also participated as they are directly involved in implementation and indigenization of Western curricula. Academic staff from undergraduate, masters, doctorate, and professional training programs participated, many of whom work across levels. The majority work with first-year matriculated students or students in the preparatory, or foundation, levels<sup>1</sup>, and between 26% and 39% teach in the other undergraduate levels. The greatest number of respondents teach in preparatory / foundation (remedial English, mathematics and academic skills) and arts and humanities areas while the fewest are in education. A smaller number teach at the graduate levels (17% master's, certificate, or diploma, and 1.0% doctoral). Table 1 indicates the apportionment among discipline areas<sup>2</sup>.

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<sup>1</sup> Students in the preparatory programs do not matriculate until they meet the minimum requirements for English language and, often, mathematics.

<sup>2</sup> For analysis purposes, disciplines have been grouped together into seven categories: preparatory / foundation, arts and humanities (including professional/white collar (e.g., human resources, accounting), law, and vocational/blue collar), general education (first or second year pre-specialization courses), library and learning support services, general education (first and second year), STEM (science, technology, engineering, and math) and medicine/nursing and education. Respondents who selected 'other' were re-categorized based on the explanations provided. For example, those respondents who added 'business', 'logistics', and 'counseling' as explanations were grouped with the arts and humanities category, while ESL / TESOL / English teaching participants were added to prep / foundation.

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Respondents are well qualified, as many hold a master's degree (61.3%) or doctorate (25.5%) as their highest qualification, and almost half (49.5%) have attained at least one post-secondary education qualification related to education (e.g., training, instruction, teaching, curriculum design), and 19.6% hold two or more.

Table 1

### *Discipline / Area of Teaching or Student Support*

Discipline / Area	<i>n</i>	%
Prep/foundation	41	20.1
Arts + humanities	41	20.1
General education	40	19.6
Library + learning support	37	18.1
STEM + med/nursing	28	13.7
Education	17	8.3

Females respondents ( $n = 110$ ) outnumber males ( $n = 94$ ), and age-wise, respondents were split evenly above and below the 45-year mark. The largest age group are 35 to 44 years old ( $n = 71$ , 34.8%), with the majority from the US (23%), UK (15.5%), Canada (9.8%), and Ireland and India (both at 5.7%). The highest proportion of participants are working in the United Arab Emirates (UAE) (34.3%) and Bahrain (28.9%), with the smallest representation in Saudi Arabia (2.9%). Figure 2 illustrates the distribution.

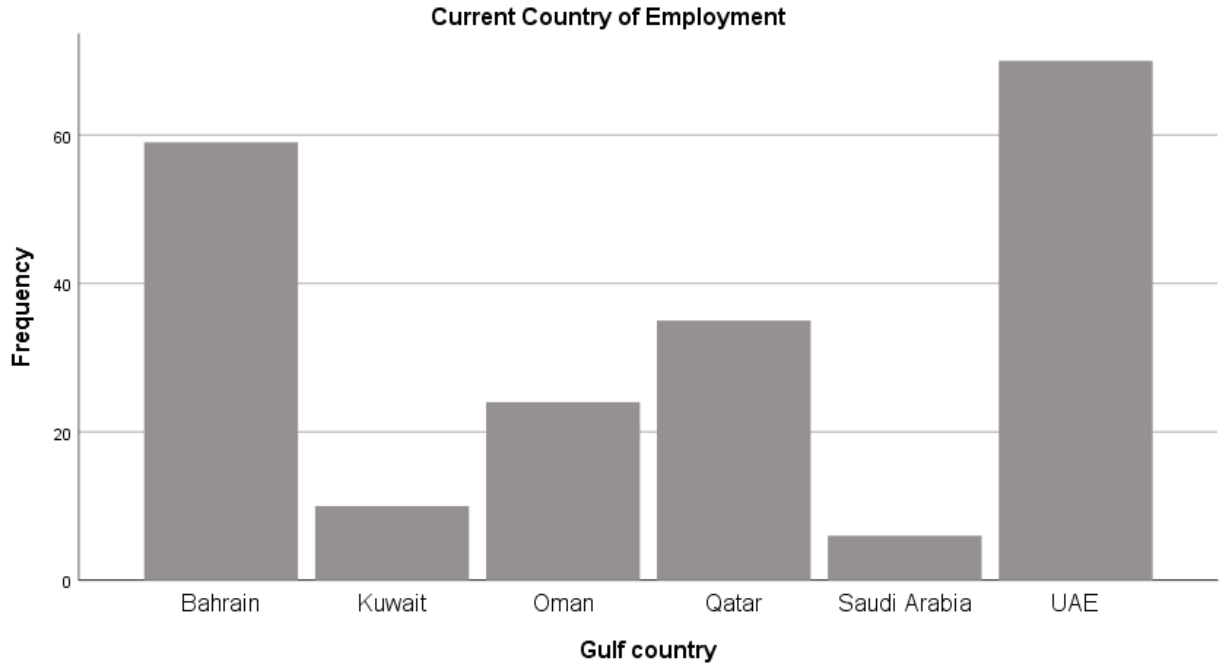


Figure 2. Current Gulf Country of Employment.

**Measures and instrumentation.** The main construct of the study, information literacy, involves five key components. The needs analysis did not expand on or further delineate these components. Given that the focus was on academic staff perceptions of information literacy, the questionnaire opened with this conception, listing the five components on the first page. This established a common understanding of the construct for participants.

Respondents indicated their perceptions of various aspects of information literacy through six-point Likert scale ratings and two optional open-ended items which elicited student factors (e.g., background, characteristics, study habits, etc.) that impact the development of IL in their current higher education institution. Items addressed the degree of effect on student IL development (1 = *no effect at all* to 6 = *very strong effect*) of three factors, namely testing, teaching, and students' choice in the research topic, and

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elicited ratings of IL skill levels of both student and respondents themselves (1 = *absolute beginner* to 6 = *expert*). Participants also indicated the degree to which they, their institution, and students value and are aware of information literacy, as well as its importance to their daily work with students. Respondents rated how often students need to use the five information literacy components in their course work or student support services (1 = *never* to 6 = *always*), and the presence of each IL component in their own pedagogy (*do not teach / teach*) and assessment (*do not assess / indirectly assess (part of a grade) / directly assess (grade)*).

In terms of pedagogy, respondents rated their confidence levels in teaching information literacy (1 = *not at all confident* to 6 = *extremely confident*), and the frequency with which they use specific materials and methods for course work (e.g., presentation slides, course books, students' own choice of topic) and assessment of learning (e.g., multiple choice tests, essays requiring research). Participants' general teaching approach, preferences (in teaching and learning) and perceptions of student needs, from highly *learner-centred* (students actively learning, exploring, etc. with instructor assisting as needed) to highly *teacher-centred* (instructor talking/lecturing with students listening/note-taking) pedagogy were also addressed.

Finally, respondents provided data related to demographics (e.g., age, gender, nationality, ethnicity, education), employment (e.g., discipline/area, current GCC country, time with current employer and in the Gulf, plan to remain in Gulf), current teaching (e.g., student level, e.g., 1<sup>st</sup> year, masters, etc.), and their own learning history (e.g., geographic region and student-/teacher-centredness of primary, secondary, and higher education).

## **Procedure**

Participant recruitment combined convenience, judgment, and snowball sampling and ran from late March to early May, 2016, primarily through requests and applications to higher education institutions ( $n = 36$ ), social media (e.g., Facebook, LinkedIn, Twitter), professional online networks (e.g., regional listservs for librarians and writing centre staff), and regional professional associations such as the Gulf Education Society, Teachers of English to Speakers of Other Languages (TESOL), and the Arabia Technology Special Interest Group). In addition to multiple reminders posted to these media and networks, email reminders were sent to Gulf institutional contacts as often as permitted (one to two). Respondents all completed the same survey.

Response rates are not available given the sampling methods and challenges associated with data gathering in the region (e.g., limitations on availability of data on total number of academic staff at the institutional levels), nor is the number of potential respondents reached through snowball sampling and social media. There were 254 partial completions, likely the result of technical difficulties from the survey provider, SurveyGizmo (e.g., intermittent web delivery problems resulting in temporary access problems). Anecdotally, several eligible individuals ( $n < 10$ ) reported by email or in person that they could not finish the survey, despite repeated efforts to do so, and a small number ( $n < 5$ ) of individuals indicated that the survey took longer than expected, and suggested that this might preclude others from completing it. Invitation messages stated that the survey took 10-15 minutes (based on trials), however these individuals indicated that it took up to 20 minutes. This may also partially explain the high number of incomplete surveys, especially considering that all 39 items, other than the open-ended

ones, were required. This is an important consideration for future survey design. The total number of responses, 204 is lower than anticipated but also understandable, given the survey's geographic span of six countries and its timing, late in second semester of the academic year.

**Data collection.** Due to the wide geographic range of the study context, an online (web-based) survey questionnaire (Caldwell, 2016) was the most practical method for a descriptive, exploratory needs analysis. The 36 closed-ended six-point Likert ratings, radio button, drop-down menu, or select all that apply items were required. An additional three items were optional. Two open-ended items addressed factors which may affect student development of information literacy, and the third elicited respondents' use of additional materials and assessments.

Two academic staff, a Palestinian male (Australian nationality) and Pakistani female, piloted the survey in separate cognitive interviews of approximately 45 minutes each<sup>3</sup>. Two other academic staff, a British male and Australian female, trialed a second, revised version online, independently, and unobserved. Based on their feedback, no further adjustments were made. Once the questionnaire went live and applications to run the survey at Gulf higher education institutions began, one optional item was removed from the end of the survey due to a concern from one institution about its option for respondents to enter contact information for updates on the research. In its place, a closing message encouraged participants to contact the researcher directly if interested.

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<sup>3</sup> Their comments and suggestions, along with observed behaviour (e.g., pauses, brow furrowing), led to significant enhancements in wording (adding clarity and explanations for respondents without specific background or training in education or pedagogy) and to corrections to items (e.g., geographic regions).

**Data analysis.** Data analysis involved the statistical software Statistical Package for the Social Sciences (SPSS) (IBM Corporation, 2017), Microsoft Excel, and an online concordance program (Cobb, 2018). Descriptive analyses and t-tests (paired samples) of quantitative data were primarily of means and sums of forced choice responses, some of which involved recoding for binary analysis of Likert scale. Cobb's (2018) frequency analysis program for language provided an initial sense of common terms and themes in the qualitative data, and Excel served as the central tool for coding comments and calculating (sums, means) of themes.

### **Findings and Discussion**

**Importance and awareness of information literacy.** Results from data analysis indicate that information literacy is important to the majority (88.4%) of respondents' every day work with students (teaching, testing, and academic support). Not surprisingly, over 90% of respondents value (92.4%) and are aware of IL (91.5%), which is consistent with findings from other higher education studies (Bury, 2011; Cannon, 1994; DaCosta, 2010; Dubicki, 2013; Gullikson, 2006; Saunders, 2012). While just over two-thirds of academic staff (69.6%) agree that IL is a priority at the institutional level, the majority (64.5%) disagree that students are aware of or think information literacy is important (61.4%) overall.

This is consistent with students' own views as reported in Bendriss et al.'s (2015) study in a Qatari higher education setting in which undergraduate respondents stated that IL skills were not applicable to their everyday lives other than online shopping (evaluation of sources). Self-report data from Bendriss et al.'s (2015) study suggest that students did not put much effort into information literacy training sessions or agree with



the weighting of this portion of their course - 10% - in their overall grade. One respondent in the current study explained a similar observation that, “[s]ince information literacy is a process skill, rather than something that gets tested for right and wrong answers, ...[students] do not value it” (Respondent 41). This suggests an emphasis on outcome over process and may be linked to Gulf students’ academic culture. To illustrate, Brownie et al.’s (2015) findings from Gulf higher education nursing students’ perceptions of teacher- and learner-centred learning, discussed in the previous chapter, indicate a similar emphasis on, or comfort with, the outcome, or product, of learning. Participants in Brownie et al.’s (2015) study not only preferred a didactic approach with more transactional, right/wrong feedback, they actively resisted constructivist, inquiry-based learning. In addition, they rated instructors who engaged in more active, constructivist learning approaches negatively (Brownie et al., 2015). Importantly, this aspect of Gulf academic culture may reflect a lack of experience and awareness of the value of both the process of learning, and of information literacy, as suggested by one participant:

Students are passed through the system from elementary to university without good academic standards, so they have an inferior education overall. Expectations are low, as seen by the level of students allowed to enter university. This means they have very little awareness of what they need to be a truly good student and develop information literacy. (Respondent 62)

***Information literacy components.*** Participants rated the importance of each of the five information literacy components on a scale from one (*not at all important*) to six (*extremely important*). The effective use and communication of information was rated as most important to students’ academic success ( $M = 5.29$ ,  $SD = 1.12$ ), and to students

themselves ( $M = 4.26$ ,  $SD = 1.47$ ), 1. In other similar studies of higher education student IL levels, there is variability in these rankings. Pinto's (2016) study of faculty perceptions at a Spanish university found the same high ranking of the communication of information. Bury (2011), on the other hand, found at a Canadian university that faculty rate the evaluation of information and its sources as top priority information literacy skills. According to needs assessment data, Gulf academic staff also perceive determining the kind of information needed to be the second-most important IL skill for students' learning and academic success. However, they rate learners' actual levels as only  $M = 3$  ( $SD = 1.21$ ) on a 6-point scale (from *very low* (1) to *very high* (6)). Overall, participating academic staff perceive IL in general to be important to students' academic success, with a mean rating of 4.2 ( $SD = .91$ ) out of six (6 = *extremely important*). The understanding of the ethics of use was rated the lowest in importance both to students themselves, and to students' academic success. Table 2 summarizes these rankings. Paradoxically, qualitative data suggest greater concern about the related concepts of plagiarism and academic honesty with 16 comments of 195 (8.2%) referring to it specifically as a problem. Linking the notion of ethical use of information to students' vernacular culture, Respondent 106 wrote that "cultural beliefs that helping a friend is necessary and the will of God means that they do not recognize plagiarism as readily as some cultures".

***Information literacy skill levels.*** Respondents rated students' levels of the five information literacy components as generally weak, with a combined overall mean score of 2.42 ( $SD = .87$ ) on a Likert scale from *very low* (1) to *very high* (6). Table 2 indicates that managing information is perceived as students' strongest information literacy component, followed by the effective use and communication of information.

Table 2

*Perceptions of Student Skill Levels and Importance of Information Literacy*

Information literacy component	Ss' skill level	Importance to Ss' acad. success	Importance to Ss themselves
	<i>M (SD)</i> , rank	<i>M (SD)</i> , rank	<i>M (SD)</i> , rank
Use/communicate info effectively	3.04 (1.07), 2	5.29 (1.12), 1	4.26 (1.47), 1
Determine the kind of info needed	3.00 (1.21), 3	5.14 (1.22), 2	4.04 (1.50), 2
Evaluate info and its sources	2.64 (1.20), 4	5.10 (1.29), 3	3.70 (1.62), 4
Manage (organize, store) info	3.20 (1.32), 1	5.03 (1.12), 4	3.96 (1.54), 3
Understand ethics of use	2.63 (1.28), 5	4.87 (1.39), 5	3.23 (1.54), 5

*Note.* Ss = Students

Findings indicate that students' third ranked information literacy competency in terms of skill level, *determining the kind of information needed*, is deemed important to their academic success and to students themselves (as indicated by its ranking at second overall in both categories). In a skills decomposition study at two universities in the Netherlands, (Brand-Gruwel et al., 2005) found that IL experts spent up to five times longer than novices on the first step, defining the information problem and its sub-skills, concretizing the task with well-formulated questions and clarifying the task requirements. Empirical studies indicate that Gulf students have difficulties with the defining and searching phases of IL (Al-Muomen et al., 2012; Martin, 2016), as do international students in Western, English-medium environments (Chung & Yoon, 2015; Hughes, 2013), and those studying in their native languages (Rosman et al., 2016a). Searching, in

particular, was cited as an indicator of IL weakness in the needs assessment data. One respondent notes that a barrier for Gulf learners is the perceived ease and efficacy of search engines such as Google, stating that because of a lack of “past library / information experiences” they have “high confidence in their current information seeking behavior – largely based on searching Google – so why learn about IL??” (sic) (Respondent 96). This complex skill has traditionally been treated as a single competency, (American Library Association, 2000), while findings from skill decomposition studies by Brand-Gruwel et al. (2005) and Brand-Gruwel et al. (2009) suggest two distinct, crucial stages: defining the problem and searching for information, as learners must first understand the problem or task itself, and “define and delimit the task domain” prior to searching (Frèrejean, van Strien, Kirschner, & Brand-Gruwel, 2016, p. 91). Although clearly a challenge for a wide range of learners, needs assessment data suggest that Gulf learners may be over-confident in their perceived abilities with these two competencies. One respondent explains that,

[Gulf higher education learners] prefer the ‘ease’ of Google not realising the importance of academic information. They often describe themselves as visual learners which can inhibit information searching in more challenging information mediums... They are often not aware of their own skill gaps in terms of searching and responsibly using information. (Respondent 339)

Just over two-thirds (68.7%) of academic staff report that students need to use information literacy more than half of the time in their courses, and the majority (80.1%) agree that the effective use and communication of information is needed the most, while understanding ethics of use, is least needed (58.3%). These results are similar to

respondents’ rankings of the importance of the five components discussed earlier, with determining the information needed ranked second once again.

**Teaching/learning information literacy.**

**Class work.** A sizable portion of participants (82.7%) report that they address information literacy in general in their class work, and the largest number of respondents both teach (90.4%) and evaluate the effective use and communication of information directly or indirectly for a grade (87.3%). Table 3 summarizes these findings.

Table 3

*Presence of Information Literacy in Courses or Support Services*

Information literacy component	Ss must use >50% (%), rank	Taught (%)	Assessed (%)
Determine the kind of info needed	71.1, 2	86.2	80.4
Evaluate info and its sources	64.7, 4	87.6	79.9
Use/communicate info effectively	80.1, 1	90.4	87.3
Understand ethics of use	58.3, 5	79.1	66.1
Manage (organize, store) info	69.1, 3	70.1	61.0
<i>M</i>	68.7	82.7	74.9

*Note.* The second column, *Ss must use >50%*, is the percentage of respondents who require students to use the particular information literacy component more than 50% of class time; Ss = Students

These results suggest a strong presence of information literacy in academic work, which is consistent with respondents’ consensus that both their teaching (88.1%) and testing (84.6%) of IL affect student IL development. The use of students’ choice in determining the study or research topic was the lowest rated influence among the three (teaching, testing, and student’s choice), however it is clearly recognized as an influence at 81.9%.

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Overall, this may indicate academic staff's sense of agency in student information literacy development through teaching and testing, as well as an awareness of the potential for and value of students' input. As noted, the role of student motivation, interest, and curiosity in the information search process has been shown to have an impact on IL development (Grossnickle, 2016; Noordewier & van Dijk, 2015). Paradoxically, findings related to the materials that academic staff use in their classrooms and student support areas suggest that this awareness is not translated into implementation. That is, over two-thirds (69.3%) of respondents use students' choice less than half of the time, and just under a half report that they *never* (13.2%) or *seldom* (29.6%) use it. At the same time, almost three-quarters (73.9%) of academic staff indicate that they use presentation slides (e.g., PowerPoint handouts) more than half of the time, split almost evenly among *often* (22.5%), *usually* (24.0%), and *always* (25.5%). Figure 3 offers a visual representation of this phenomenon, while Table 4 summarizes the average among five teaching and learning resources used in courses and student support units. This predominant teacher-centred method of delivery may explain the findings from respondents as well as from empirical research (Bendriss et al., 2015), discussed above, related to students' limited value of IL. That is, it may reflect an element of instruction that reinforces a passive learning, product-over-process approach.

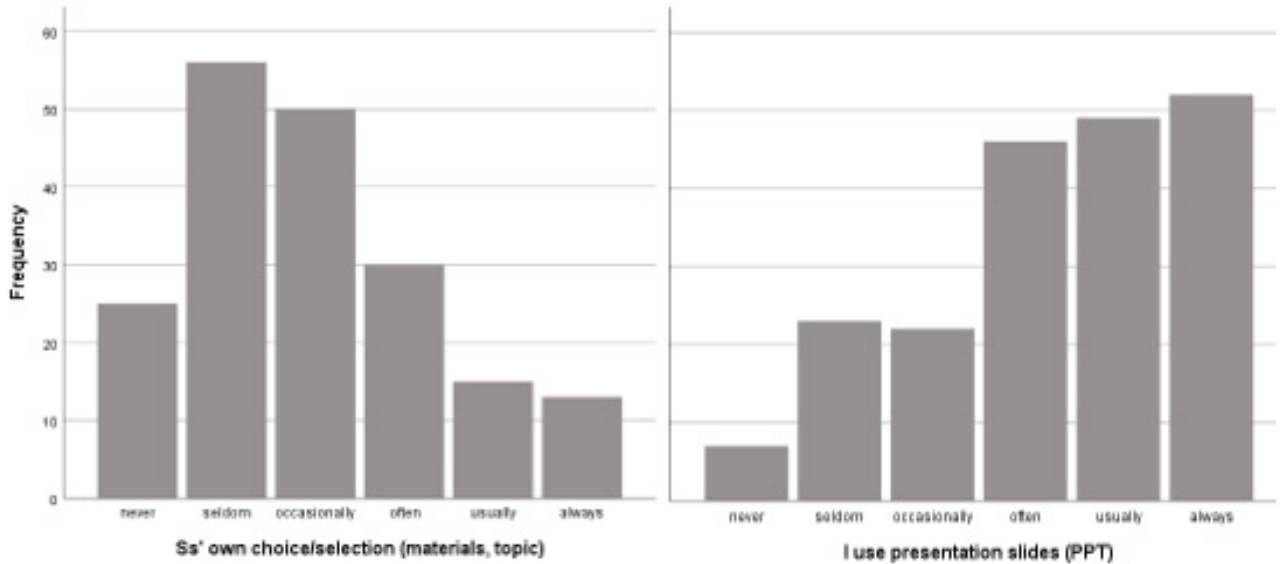


Figure 3. Frequency of use of presentation slides and students' choice in course work / student support.

Table 4

Frequency of Use of Teaching and Learning Resources in Course Work / Student Support

Information literacy component	Frequency of use (/6) <i>M (SD)</i>	Used > 50% (%)
Web / online resources	4.48 (1.13)	81.0
Presentation slides / PPT handouts	4.32 (1.45)	73.9
Textbooks or chapters	4.12 (1.48)	65.8
Scholarly articles	3.26 (1.60)	45.0
Ss' own choice (materials, topic)	2.96 (1.39)	30.7

Note. The third column, *Used > 50%*, is the percentage of respondents who use the particular information literacy component more than 50% of class time; Ss = Students; PPT = PowerPoint

**Teaching approach.** Participants responded to items that required them to rate their teaching approach using a six-point Likert scale, where 1 is *very student-centred*

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(students actively learning, exploring, etc. with instructor assisting as needed) and 6 is *very teacher-centred* (instructor talking/lecturing with students listening/note-taking). To compare participants' teaching approach prior to coming to the Gulf with how they teach now, a paired samples t-test was conducted with 175 valid responses. Findings indicate that participants' approach before the Gulf was more student-centred ( $M = 3.04$ ,  $SD = 1.54$ ) in their prior environments, and had become more teacher-centred ( $M = 3.29$ ,  $SD = 1.46$ ) in the Gulf. The difference is weakly significant ( $t(174) = -1.681$ ,  $p = .095$ ), not controlling for individual differences. Further, following recoding for binary analysis (ratings of 1-3 = *student-centred* and 4-6 = *teacher-centred*), descriptive analysis findings indicate that the majority of respondents, just under two-thirds (60.6%), rated their approach as student-centred before coming to the Gulf, however this proportion dropped 6.3% to just over half (54.3%) now in their Gulf teaching contexts. This finding suggests that Gulf teachers adjust their pedagogy to incorporate a more teacher-centred approach with Gulf higher education students. In their Qatar-based higher education study, Bendriss et al. (2015) found similar trends, with most instructional sessions characterized as lecture-based, much like the findings in colleges and universities elsewhere in the Gulf (Aydarova, 2012; Hamdan, 2014) and K-12 settings (Gallagher, 2011; Hatherley-Greene, 2014; Lightfoot, 2015).

Qualitative data, discussed below, are consistent with these findings and suggest a pervasive perception of Gulf students as passive learners. Additionally, and as Table 5 indicates, more than twice the number of participants rate student-centred approaches more favourably than teacher-centred in four categories. Specifically, double the participants perceive a student-centred approach is best for higher education students



outside the Gulf (76%,  $n = 133$ ), and is their own most effective (67.8%,  $n = 135$ ) and preferred (73.9%,  $n = 147$ ) teaching approach. Finally, well over two thirds (67.8%,  $n = 135$ ) prefer a student-centred approach for their own learning. These results are discrepant from previously published findings, discussed earlier, that described a mismatch between Gulf students' preference for and comfort with a teacher-centred approach and the active, participatory constructivist approaches in Western higher education settings (AlAlami, Al-Saleh, & Rahal, 2013; Brownie et al., 2015; Minnis, 1999; Minnis, 2006; Souleles, 2013).

Table 5

*Perceptions and Self-ratings of Student- and Teacher-Centred Approaches*

Perception	student-centred % ( $n$ )	teacher-centred % ( $n$ )
My teaching approach prior to the Gulf	60.6 (106)	39.4 (69)
My teaching approach currently	54.3 (108)	45.7 (91)
Best teaching approach for my Gulf students	53.1 (102)	46.9 (90)
Best teaching approach for non-Gulf students	76.0 (133)	24.0 (42)
My most effective teaching approach	67.8 (135)	32.2 (64)
My preferred teaching approach	73.9 (147)	26.1 (52)
My preferred learning approach	69.4 (136)	30.6 (60)

As for confidence in their own information literacy abilities, a large majority of respondents (ranging from 86.8% to 92.7%) rated themselves at level 5 or 6 (6 = *expert*) for each of the five IL components. Table 6 summarizes participants' mean ratings for each IL component as well as their level of confidence in teaching each one (1 = *not at all confident* to 6 = *extremely confident*). Despite respondents' high self-ratings of

awareness, skills, and confidence in teaching information literacy, over a tenth (11.8%) of respondents’ comments specifically point to limitations and weaknesses in their own IL skills and related pedagogy as factors that impact student information literacy development.

Table 6

*Self-rating of Information Literacy and Confidence in Teaching IL*

Information Literacy Component	Self-rating of own IL skills (/6) <i>M (SD)</i>	Confidence in teaching IL (/6) <i>M (SD)</i>
Determine the kind of information needed	5.41 (0.94)	5.07 (1.09)
Evaluate information and its sources	5.42 (0.91)	5.09 (1.12)
Use/communicate information effectively	5.39 (0.96)	5.11 (1.08)
Understand the ethics of use	5.35 (1.08)	4.91 (1.30)
Manage (organize, store) information	5.33 (1.00)	4.93 (1.22)

Qualitative data point to particular factors of academic staff knowledge, dispositions, and skill levels that impact student information literacy development. In the optional survey prompt regarding these factors, participants specified “inconsistent understanding of IL among faculty” (Respondent 451), “attitudes and approaches” of instructors (Respondent 438), and “capability of teacher to impart information literacy” (Respondent 243). These sentiments are not surprising given that, in the majority of higher education settings, teaching faculty have not been formally taught IL skills or the pedagogy to support students’ IL, and instead, have likely developed them independently and in isolation (Kracker, 2002). In fact, empirical research suggests that faculty expect their students to develop IL competencies in the same way – on their own - and are therefore less likely to integrate instruction into their courses (McGuinness, 2006;

Oakleaf, Millet, & Kraus, 2011). Although research indicates that academic staff awareness of the information search process and their own information literacy skill levels impact student IL development (Carlson, Fosmire, Miller, & Nelson, 2011; Kracker & Wang, 2002), the role of information literacy in higher education curricula remains underrepresented. That is, IL is not an explicitly taught discipline per se, but rather a set of skills relevant to all fields and contexts (Weiner, 2014). This widespread issue – the low curricular and pedagogical status of information literacy – also prevails in Gulf higher education:

In my experience, information literacy is not perceived by ... [faculty] as key to student development; indeed many of the [faculty] I have trained... are lacking in info literacy skills and knowledge, and see it as a challenge or an unnecessary bolt-on. (Respondent 185)

Needs to be across the curriculum. Unfortunately, many classes do not support this and students just pick first website that appears. (Respondent 43)

There are two key elements, one students need opportunities to work and receive instruction directly fro librarians, this instruction must be reinforced by subject faculty across the curriculum continuously and at different levels. (Respondent 63)

**Factors impacting information literacy development.** An unexpectedly large proportion of respondents, 70.6% ( $n = 144$ ), completed the optional one or both of the open-ended survey items with 35.4% of them answering both.<sup>4</sup> The 195 total contributions yielded 463 factors believed to affect student development of information

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<sup>4</sup> One of these items opened the survey ( $n = 140$  responses), placed immediately following the definition of information literacy to avoid bias, and the second ( $n = 55$  responses) came ten items later, after respondents had rated student levels of IL, as well as the awareness and importance of IL for the higher education institution, students, and respondents themselves.

literacy at respondents’ higher education institutions. As Table 7 illustrates, over two thirds of this group of commenters ( $n = 97$ , 67.4%) remarked on two to five factors each, while 28.5% ( $n = 41$ ) identified six to ten. No factor was repeated by the same respondent and, considered alongside the quantitative findings, these qualitative contributions are likely representative of the sample overall.

Table 7

*Comments Related to Factors Impacting Information Literacy Development*

Factors <i>n</i>	Commenters <i>n</i>	% of commenters	% of participants
1	4	2.8	2.0
2 - 5	97	67.4	47.5
6 - 10	41	28.5	20.1
10 - 15	2	1.4	0.1

Thematic analysis followed Lochmiller and Lester’s (2017) iterative approach that begins with organizing the data in a table, becoming intimately familiar with the data through repeated reading, and “memoing” (p. 173) the data with more holistic impressions before the coding phase. This iterative process of analysis of the 463 factors revealed 49 sub-themes and four broad themes of influences on student development of information literacy: previous learning experience, socio-cultural factors, language and literacy, and pedagogical and institutional conditions. Table 8 summarizes these themes. (See also Appendix A for further details.) Collectively, these four themes can be further apportioned into features of students’ academic and vernacular cultures, and are consistent with findings in the literature review.

Table 8

*Factors that Affect Student Development of Information Literacy*

Theme	Sub-themes	<i>n</i>
Previous learning	K-12 education experiences and its impact on: critical thinking, IL/research skills, study habits, plagiarism, info search skills (overreliance on Google), rote-learning, IT skills, library awareness, background knowledge, managing information, misc. skills	212
Socio-cultural influences	Family and cultural background and impact on: motivation, interest/curiosity, epistemology, independence, socio-economic status, gender, and misc. variables	142
Language / literacy	Reading skills, English language proficiency, first language (L1) proficiency	56
Current learning context	pedagogy, institution (emphasis on IL, infrastructure), whether IL is taught or graded, students' own choice	53

***Previous learning.*** The largest proportion of respondents ( $n = 57$ , 39.6% of commenters, 27.9% of respondents) identified learners' education background (K-12 learning experiences) as the main factor in student development of information literacy. Considering the earlier discussion of the learning environment in Gulf government schools (Gallagher, 2011; Hatherley-Greene, 2014; Souleles, 2013), as well as Gee's (2008) theoretical socio-cultural framework of situated cognition and the role of academic culture, this proportion is to be expected. In addition to the rote-learning, didactic teacher-centred approach in K-12 schooling, a common sentiment was that infrastructure and curriculum in government schools play key roles, as one respondent states, "[s]ome schools locally are under-resourced in terms of qualified library staff and

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ICTs/other resources, and in many schools the curriculum doesn't value critical thinking or research skills” (Respondent 90). As discussed in the previous chapter, research findings in Bahrain (Lightfoot, 2015), the UAE (Martin et al., 2010), and more broadly across the region (Wiseman & Anderson, 2012) are consistent with respondents’ comments in terms of resources in government K-12 settings, as well as the nature of the underlying Arab-Islamic epistemology that encourages emulation (Bashir-Ali, 2011) and rote-learning over critical thinking (Diallo, 2014).

*Learner engagement.* Several participant comments referred to the effect of learners’ previous education experiences on engagement in learning in general, and information literacy specifically, as expressed by Respondent 197 who stated that “[a] lot of students are used to rote learning and so are not used to the idea of finding information independently... They don’t take it as their responsibility...” This is echoed by another participant, who explains:

The students are very passive individuals who need to be told how to do everything. It is my understanding that in their public school they do a lot of memorizing, but they lack education in critical thinking and researching information. They do not do referencing. They are also passive at studying. (Respondent 119)

This characterization of Gulf learners as passive in their approach to their studies, with little or no independence in learning or initiative-taking, represents a prevalent perception among participants that learners’ K-12 learning experiences influence information literacy development in Western higher education settings. Empirical studies confirm these findings, both in their characterization of learners’ experiences in teacher-centred, rote-learning, memorization-focused K-12 environments schools (Gallagher,

2011; Hatherley-Greene, 2014; Souleles, 2013), and the resulting challenges in engaging in active learning, critical thinking and creative problem-solving in higher education contexts (Prowse & Goddard, 2010; Romanowski & Nasser, 2015). Dickson and Kadbey's (2014)'s research of teacher training of UAE nationals found a persistent influence of K-12 learning on trainees' development of their own pedagogical skills whereby, despite having been taught learner-centred inquiry instructional techniques over their four years at the college, "far fewer had actually carried out an inquiry independently" (p. 347) and only a small number indicated that they would allow their own students to explore science concepts on their own with minimal input from them.

*Background knowledge.* Beyond a reluctance to engage in independent learning, another common factor cited in participants' comments involved limitations in students' background knowledge as a serious impediment to IL development. While a large number of respondents simply listed "prior knowledge" or "background knowledge" as factors, without further explanation, Respondent 267's statement is broadly representative of others' sentiments that "information literacy is critical in today's society yet this culture there is still remains a need for fundamental knowledge and skills to be learned". These views are also reflected in findings by Gulf researchers Hatherley-Greene (2014) and Khelifa (2009) that indicated students' low academic maturity and deficiencies in global awareness as some of the most pressing challenges learners face in higher education learning.

*Socio-cultural influences.* The second-most cited influence in participants' comments addresses another complex area, socio-cultural factors, namely students' vernacular culture. The perception of the impact of Arab-Islamic culture on Gulf students

is, as one respondent described, that “[m]ost seem to arrive unlikely or unwilling to question authority or information. They predominately seem to just want the information they need to get to them to the next step” (Respondent 455). This comment suggests a view that learners depend more on the teacher or written information than on the active, independent construction of knowledge that relies more on active inquiry and inquisitiveness. One participant noted that,

cultural factors play a role. Students are often looking to an authority to provide them with direction, evaluation, ethics, etc. Since this seems to be such a strong cultural force, they are less likely to feel the need to develop these skills for themselves; in fact there is almost an aversion to do so because it goes against a basic belief that they, as individuals, do not possess the knowledge, skill or talent to accomplish tasks independently. (Respondent 99)

These data indicate an enduring view by Gulf academic staff of students’ Arab-Islamic epistemology that it leads, according to one respondent, to considerable challenges in active engagement in learning in higher education as “... [students] have never learned how to learn. They do not know how to be curious, how/why to take notes, or how to think critically” (Respondent 99). These views are supported by empirical research findings related to the effect of Arab-Islamic epistemology on Gulf students’ learning experiences in Western-modeled higher education environments (Diallo, 2014; Karabenick & Moosa, 2005; Khelifa, 2009; Kosior et al., 2015; Muysken & Nour, 2006; Sonleitner & Khelifa, 2005; Syed, 2003; Wiseman & Alromi, 2003) whereby learners may exhibit opposition to or discomfort with active learning (Brownie et al., 2015), or challenging authority or information (Lemke-Westcott & Johnson, 2013; Wiseman &



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Alromi, 2003). As one participant explained, “I find students too willing to blithely accept “what is written” as the truth, and to take readily and at face value what is presented to them as unquestionable” (Respondent 56). These dispositions towards knowledge and learning impact Gulf learners even at graduate levels, as described by Respondent 98:

Even in their Master papers they take their ideas from the Internet without really understanding what they are writing-they are simply copying what they read. This is a great worry for many of the faculty here as student are not processing nor are they able to analyze the information to problem solve or create a solution or even suggest a solution. How can the locals (Emirates) become the next global generation when they are simply "copying" and "cheating" to get the right answers?

Importantly, the notion of cheating is perceived in vastly different, and often conflicting, ways by Western-trained academic staff and Arab-Islamic students in Gulf higher education. Here, the pursuit of independent or collaborative learning can be viewed as a Western versus Gulf divergence. One participant explains this contrast as a cultural issue:

... if your grandparents come from a society where cooperation is valued over competition, then it is likely that your parents will still believe that to a great extent, which means that you as a kid will too. Consequently, when you get to university and you are called up for giving your friend the answers to questions on a quiz, you are, in effect, at the epicentre of the collision of two cultures – the old nomadic one, which values cooperation... and the new Western one, which turns those things on their heads. (Respondent 45)

These data, complemented by findings from empirical studies suggest a perception by academic staff that Gulf learners engage in more superficial, surface-level learning in which they may have little willingness to interact with the information or authority figures (educators, in this case). A telling example of the pervasive reluctance to challenge authority is conveyed through academic staff's own hesitancy to discuss this issue openly, stating, “[n]ot sure I am able to answer this, speculate maybe ... reading is not encouraged at home, questioning is not allowed” (Respondent 387). Anecdotally, this cautious response is consistent with the current climate in several institutions whereby critical perceptions of student in general, and vernacular culture specifically and its impact on learning are not to be vocalized, considered, or importantly, addressed.

*English language and literacy.* A crucial and less culturally sensitive factor perceived to affect information literacy development is the significant impact of Gulf learners' language and literacy levels on their engagement and achievement in learning (Belhiah & Elhami, 2015; N. Johnston et al., 2014; Mahrous & Ahmed, 2010). Over one-third of commenters ( $n = 53$ , 36.8%) referred to the great challenges students face due to their limitations in literacy (reading and writing), as well as in English language proficiency. As one participant noted, “many students in Gulf tertiary education are studying in English medium with limited or restricted proficiency in the language” (Respondent 131). Another respondent directly points to the impact on information literacy, and sums up the significant challenges learners face:

Students at our ... institution are all nationals, predominantly public school graduates enrolling on Bachelors programs delivered in English. They have inadequate language skills and very little exposure to libraries and the research

process. It is extremely challenging for them to engage with college level resources.  
(Respondent 163)

In Belhiah and Elhami's (2015) study of the views of 500 students and 100 faculty at six universities in the UAE, results suggest that low English language proficiency and limited reading skills impede learning overall, and engagement in independent use of resources to learn the subject matter specifically. Concordance results of the current needs assessment qualitative data indicate that the terms *read* and *literacy* and their derivatives are mentioned extensively. Interestingly, the majority of comments assign socio-cultural or family factors as the primary drivers behind literacy development, as can be seen by one respondent's statement that, "... if your grandparents do not know how to read, and your parents barely know how to read, you are unlikely to become much of a reader" (Respondent 45). Further support for this view is evident in comments about the absence of a reading culture in learners' first language, Arabic, and that students do not come to higher education as readers per se. The impact of limitations of both language and literacy on information literacy is clearly stated by Respondent 357's assertion that students' "lack of English proficiency is the main problem affecting information literacy as they often do not fully understand much of the information that they access via technology. Lack of reading culture is another key factor". These data indicate a perception that a lack of basic proficiency in English and reading plays a significant role in information literacy development, and learning in general.

***Current educational context.*** Results related to the fourth and final category, students' current learning context, point to the nature and quality of academic staff's pedagogy and information literacy skills in tertiary environments, as well as the

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institutional infrastructure (e.g., library, Internet, ICT resources). While several comments refer to constraints at the institutional level, the following contribution captures several related factors:

The lecture-centered instruction that focuses on rote learning is probably the least conducive to developing information literacy. project and inquiry-based learning is probably far better, but there are few opportunities or institutional incentives to risk trying such approaches, in the face of high-risk performance appraisals of teaching staff at my institution. I suspect that instructors across the Gulf region do not feel safe departing from 'accepted' methods of instruction and so teaching is trapped in an antiquated state in the region. (Respondent 474)

Not only is this reference to institutional pressures consistent with Respondent 387's reluctance to speak critically of students stated earlier, it is echoed in empirical studies of Gulf higher education faculty who, in many cases, face challenges to job security (Abouchedid, 2006; Chapman et al., 2014) and limitations on academic freedom (Abouchedid, 2006; Romanowski & Nasser, 2015). Of particular significance is the impact on pedagogy and, consequently, learner development of information literacy. Findings from needs analysis data and empirical studies portray an institutional atmosphere of fear or, at minimum, reluctance to engage learners in critical, learner-centred information seeking processes.

### **Conclusion**

Gulf higher education students, especially those from government school K-12 learning backgrounds, encounter significant obstacles to entering 21st century careers of the emerging Gulf knowledge economy (Ashour & Fatima, 2016; Hijazi et al., 2008;

Kosior et al., 2015). Findings from the current needs analysis survey data as well as extant empirical research reveal that students' development of information literacy in higher education institutions may be disadvantaged by a mismatch between their academic and vernacular cultures and those of Western-trained academic staff. Also, the results suggest that this mismatch may be related to Gulf learners' academic culture acquired in government K-12 and Arab-Islamic environments, and characterized by a passive approach to studying, resistance to independent learning, and reliance on memorization to the detriment of critical thinking and analytical reasoning skills development (Diallo, 2014; Wheeler & Anderson, 2010). In addition, low English language proficiency and skills, (Belhiah & Elhami, 2015; McLean et al., 2013) and limited background knowledge (Hatherley-Greene, 2014; Khelifa, 2009), IL skills and experience with information and communications technology and libraries (Martin et al., 2010; Wiseman & Anderson, 2012) represent further components of Gulf learners' academic culture that impact IL development. For academic staff (faculty, library, and academic support staff), needs analysis data reflect self-reported weaknesses in the technical and pedagogical skills associated with information literacy, and indicate a dominance of teacher-centred instruction.

An opportunity arises from these findings. Gulf higher education students and academic staff share a growth area of information literacy knowledge and skills on the one hand, and a predilection for instructor-led education on the other. What is missing from the findings and empirical research is the impressive resilience of Gulf learners to emulate what is expected (Bashir-Ali, 2011), and to persist in higher education despite significant barriers and what (Hatherley-Greene, 2014) terms a cultural border crossing

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when they transition from Arab-Islamic to Western education environments. Academic staff also demonstrate resilience and flexibility along the cultural border, including adapting their teaching to a more didactic, teacher-centred approach despite their own preferences as learners and educators. This opportunity points to the need for an instructional intervention to develop information literacy that meets both learners and instructors where they are - their ‘comfort zone’ – namely, a teacher-led approach with more explicit, enacted instruction.

Given the ongoing efforts in the Gulf to transition to a knowledge economy (Buckner, 2011; Weber, 2011), the pressing need for 21st century, work-ready graduates able to solve information problems demands an educational response to meet the “scale and connectedness of the global information society” (B. Johnston & Webber, 2003, p. 335) and to address the growth areas of both students and academic staff.

### **Chapter Three: Example-based Learning for Novice Learners**

Theoretical, empirical, and needs analysis findings described in previous chapters provide insights into the unique social, linguistic, cultural, and cognitive transitions that Gulf learners encounter when they cross what Hatherley-Greene (2014) deems a cultural border crossing from Arab-Islamic, Arabic-medium K-12 schooling into Western-modeled, English-medium higher education institutions. At a very practical level, Gulf learners' limited information literacy (IL) skills pose significant challenges to navigating the educational aspects of this novel environment (Martin, 2016) which is becoming increasingly reliant on skilled access and use of the World Wide Web (Brand-Gruwel et al., 2005; Saunders, 2012). On a broader level, it bears repeating that Gulf higher education graduates will cross another border into what His Highness Sheikh Mohammed of the UAE describes as an information-intensive economy (Mohamed, 2014) that requires information literate individuals with the skills and schema of the meta-competency and currency of the knowledge economy (Lloyd, 2003).

Specific barriers to students' development of information literacy may be related to the academic culture that Gulf learners acquire in government K-12 and Arab-Islamic environments. The socio-cultural construct "academic culture" encompasses a learner's way of interacting, language, and tool use (Gee, 2008). For Gulf learners, this is reflected, respectively, in their passive learning approach, low English language skills, and limited background knowledge, IL skills, and experience with library and information and communications technology (ICT) tools. Table 9 summarizes the components of Gulf learners' academic culture that may impact their information literacy development in higher education.

Table 9

*Elements of Gulf Learners' Academic Culture and their Impact on IL Development*

Academic Culture	Socio-Cultural Factors	Impact on IL Development
Way of interacting	Passive learning approach and reluctance to question authority	Reliance on memorization to the detriment of cognitive development of critical thinking and analytical reasoning skills, and preference for teacher-centred, highly guided instruction (Diallo, 2014; Romanowski & Nasser, 2015; Souleles, 2013; Wheeler & Anderson, 2010)
Language	Arabic-medium instruction, including English language	Low English proficiency and literacy (reading and writing), and challenges understanding the task, determining information needed, formulating questions, etc. (Belhiah & Elhami, 2015; Kim, 2015; McLean et al., 2013)
Tool use	Little or no access to and experience with ICT and libraries	Limited background knowledge, IL awareness and skills, including search strategies (e.g., Boolean operators) and tools (e.g., library database) (N. Johnston, Mavodza, & Jirjees, 2015; Khelifa, 2009; Lightfoot, 2015; Martin, 2016; Wiseman et al., 2014)

At the same time, needs assessment results reveal academic staff's own reported weaknesses in the pedagogical and technical skills related to information literacy, and indicate that their instructional approaches become less student-centred and more teacher-centred in *Gulf* higher education environments. Taken together, learners' passive approach to learning and academic staff's tendency towards teacher-centred pedagogy in the Gulf represent common ground between the two, based on shared preferences for a



more traditional instructor-led approach. That is, an opportunity exists to capitalize and build on these shared tendencies.

Direct, guided instruction for novice and intermediate learners is an approach with extensive empirical support (Kirschner, Sweller, & Clark, 2006; Spector, 2001) that represents an opportunity to meet both students and academic staff where they are. Example-based learning (EBL), a social cognitive instructional approach based on cognitive load theory (Sweller, 2006; van Gog & Rummel, 2010), meets students at their early, or novice, cognitive development stages of learning primarily through direct, teacher-led instruction, and by scaffolding the multiple and complex demands on working memory, or cognitive load, involved in problem solving (Renkl, Hilbert, & Schworm, 2009; Renkl, 2011; van Gog & Rummel, 2010). As such, example-based learning may represent an effective instructional approach for Gulf academic staff to support Gulf learners – novices in *information* problem-solving – to build information literacy schema and skills that enable effective border crossings within higher education and into the knowledge economy.

### **Information Problem-solving: A Sub-set of Information Literacy**

Higher education students' overwhelming reliance on the Internet and other digital resources (Gross & Latham, 2012; Smith, Given, Julien, Ouellette, & DeLong, 2013) can lead to an “information overload” or “avalanche” (Saunders, 2012; Stewart & Basic, 2014), and carefully managing this input flood requires information problem solving (IPS) skills (Brand-Gruwel et al., 2005), a sub-set of information literacy (IL) (Argelagós & Pifarré, 2016; Bruce, 2002; Timmers & Glas, 2010). Solving information problems is complex and requires higher order cognitive competence (Brand-Gruwel et al., 2005;

Frèrejean et al., 2016; Walton & Hepworth, 2011). Information problem-solving permeates formal education as a skill set relevant to all fields and contexts, however, like information literacy, IPS is not an explicitly taught discipline per se in most higher education contexts (Walraven, Brand-Gruwel, & Boshuizen, 2008; Weiner, 2014). Indeed, “although IPS is widely acknowledged to be pivotal to academic work, formal [information problem-solving] instruction has long been an insignificant element of curricula in higher education” (Wopereis, Frèrejean, & Brand-Gruwel, 2015, p. 293). Research in both employment and academic settings indicates that, while information problem-solvers of all age groups demonstrate adequate *functional* skills (e.g., web browsing, downloading apps) to manipulate and exploit digital tools and software, their *information problem-solving* skills can be characterized as absent, or underdeveloped at best (Brand-Gruwel et al., 2005; Cyphert & Lyle, 2016; Frèrejean et al., 2016; van Deursen & van Dijk, 2009; van Deursen & van Diepen, 2013). Findings from the Gulf-wide needs analysis survey data in the previous chapter indicate that academic staff rate the most *functional* or tool-based competency, information management (e.g., saving or organizing files), as the strongest of students’ five information literacy skills. The survey results also indicate, not surprisingly, that Gulf learners, like their international peers, face challenges determining the kind of information needed (ranked third among the five IL components by survey respondents), a skill that is particularly important in managing the “information overload” in the early phase of information problem-solving.

Information literacy researchers and librarians have traditionally treated the complex skill of identifying the information needed to solve an information problem as a single competency (American Library Association, 2000), however findings from

extensive skills decomposition studies over recent decades by Brand-Gruwel et al. (2005) and Brand-Gruwel et al. (2009) indicate that this crucial stage involves two iterative yet distinct steps, defining the problem and searching for information. Brand-Gruwel and colleagues' empirical research used inductive-deductive methods to observe and analyze information problem-solving by a wide range of expert (e.g., doctoral students) and novice (e.g., first-year undergraduates) learners. Findings from Brand-Gruwel et al.'s, (2005) initial study indicate that experts spend up to five times longer than novices on the first step, defining the information problem and its sub-skills, concretizing the task with well-formulated questions and clarifying the task requirements. An additional information problem-solving component that distinguishes novices and experts lies in reformulating the information problem itself by rereading the task and activating prior knowledge to determine information needs - steps that are "completely ignored by novices" (Brand-Gruwel et al., 2005, p. 503). Brand-Gruwel et al. (2005) found that in the second step, searching for information, experts iteratively adjust their search strategy and its execution based on regular and frequent (re)orientation to the task itself. Findings from a follow up study, including data from 48 protocols of participants engaged in Internet-based information searches from secondary to doctoral level learning contexts, informed Brand-Gruwel et al.'s (2009) development of the five-step Information Problem-solving using Internet (IPS-I) model. Of relevance to the current study are the first two steps of the model, discussed below and summarized in Table 10.

**Information problem-solving for novice learners.** Empirical research findings, needs assessment data, and anecdotal evidence in the current study context suggest the need to focus instructional support for novice information problem-solvers on the

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academic habits and thought processes of the first two steps of Brand-Gruwel et al.'s (2009) model. The iterative thought processes and critical thinking encompassed in these stages, especially the acts of defining the problem and formulating search strategies, may be the most crucial or important stages of the research process (Badia, 2016; Kennedy, Cole, & Carter, 1999) as they represent “the turning point of the search... [when learners'] confidence increases, confusion decreases, and interest intensifies” (Kuhlthau, 1991, p. 370).

Extensive, decades-long research of the information search process and its cognitive, affective, and behavioural components by (Kuhlthau et al., 2008), has found that students' familiarity and experience with the *tools* of research (e.g., computers) has little influence on information searches in digital environments, whereas the online or Web-based environment itself can present deep “search pitfalls” (p. 3). That is, students' overconfidence with the tools combined with the ease of access to information through the Internet often means that students skip or only superficially engage in the crucial focus formulation stage (i.e., Brand-Gruwel et al.'s (2009) IPS steps one and two) if at all, without formulating essential questions to both drive and direct their information search process (Kuhlthau et al., 2008).

Empirical research results suggest another layer of importance for the initial stages of the research process involving both cognitive and affective states. These steps are also characterized by learners' confusion, uncertainty, insecurity, frustration, and lack of engagement (Kuhlthau et al., 2008) such that they may rush to bypass this discomfort, leading to the most common consequence, a “false focus” (Kennedy et al., 1999, p. 268). A false focus occurs when students select a topic and/or thesis based on expediency

rather than personal interest or careful consideration of the topic itself, and causes significant difficulties later in the process (Kennedy et al., 1999). Additionally, it can result in shallow reasoning, assignment errors, and narrow coping strategies rather than purposeful information seeking strategies (Badia, 2016; Kennedy et al., 1999), including poorly thought-out papers that lack integration of students' own perspectives, and conclusions that are vague and undefined (Nutefall & Ryder, 2010). Undergraduates, Kennedy et al. (1999) argue, should not be pushed or rushed through initial explorative behaviour prior to online searching since they have not “mentally prepared the groundwork for achieving real focus by first seeking topic definition” (p. 268).

***Information problem-solving for novices in Western, English-medium academia.***

The role of academic culture and students' awareness and understanding of Western, English-medium academic practices is yet another consideration for an emphasis on the first two stages of information problem-solving with Gulf learners. For many non-native speakers of English, lack of familiarity with Western academic conventions and language, compounded by actual language deficits, can pose significant challenges to the initiation of the information search process. In a study at a Gulf university, results from focus group and survey data suggest a perception by both faculty and students that English proficiency plays a crucial role in the search process, including the use of suitable search terms (Al-Muomen et al., 2012). Graduate students in the same study expressed the need for training in the search process and specifically, search strategies, despite rating themselves highly overall in the information search process (Al-Muomen et al., 2012). Outside the Gulf region, Hughes's (2013) research of international students' information literacy experiences in higher education in Australia found that non-native

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speakers cited limited familiarity with Western academic practices, including lack of awareness of online academic sources and the vast range of functions and search options available with online tools, as impediments to their information problem-solving. Hughes (2013) also found that linguistic barriers negatively impacted the process of selecting search terms and synonyms, alongside more socio-cultural challenges related to the emphasis in Western education on individual or independent work.

As discussed, Gulf students have limited experience with information problem-solving, coupled with low English proficiency levels, a learning preference for collaboration and emulation, and limited awareness of Western education practices. An intervention that takes these factors into account and facilitates the development of the academic thinking habits and skills that lead to a well-defined research focus and initial search may provide early support for Gulf higher education learners to become effective information problem solvers. Table 10 summarizes Brand-Gruwel and colleagues' extensive skills decomposition research in relation to the first two components of information problem-solving (Brand-Gruwel et al., 2005; Brand-Gruwel et al., 2009; Frèrejean et al., 2016).

Table 10

*Summary of the First Two Skills of the Information Problem-solving – Internet (IPS-I)*

*Model*

Skill	Sub-skill	Expert Behaviour
Define the information problem	<ul style="list-style-type: none"> <li>• Read / understand the task</li> <li>• Concretize problem with well-formulated question(s) and clarification of task requirements</li> <li>• Activate prior knowledge</li> <li>• Determine needed information</li> </ul>	Spent up to five times longer than novices on defining the problem
Search information	<ul style="list-style-type: none"> <li>• Determine search strategy</li> <li>• Generate search terms using key concepts from the question</li> <li>• Execute search using Boolean operators, systematically adjusting terms</li> </ul>	Continuously and iteratively regulate the process to monitor progress, orient to the task, and steer performance

Note: adapted from “Information problem solving by experts and novices: Analysis of a complex cognitive skill,” by S. Brand-Gruwel, I. Wopereis, and Y. Vermetten, 2005, *Computers in Human Behavior*, 21(3), pp. 495-498 and from “Completion strategy or emphasis manipulation? Task support for teaching information problem solving,” by J. Frèrejean, J. van Strien, P. Kirschner, and S. Brand-Gruwel, 2016, *Computers in Human Behavior*, 62, pp. 91.

### **A Cognitive Development Perspective**

To reach expert levels of cognition in a particular domain, individuals must acquire organized, integrated knowledge structures, also termed *mental models* or *schema*, over time and with experience and apply the schema to solve problems (Glaser, 1992).

Emerging research suggests that the cognitive competencies to solve academic information problems tend to develop iteratively on a novice-expert continuum (Brand-

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Gruwel, Kammerer, van Meeuwen, & van Gog, 2017; Lucassen & Schraagen, 2011; Rosman et al., 2016a). Importantly, while skill and knowledge generally develop with both age (Chi, 1978) and experience (Ericsson, 2006; Glaser, 1992), these natural processes alone are insufficient for achieving expert levels. Instead, achieving expertise is a gradual process that requires *purposeful perception and creation* of meaningful patterns of information or general models in long-term memory, and *routine access and use* of these chunks in strategic, goal-oriented ways, often to solve problems (Chi, 1978; Ericsson, 2006; Glaser, 1992).

Information literacy *experts* are highly efficient, advanced information problem solvers (Brand-Gruwel et al., 2017; Brand-Gruwel et al., 2005; Brand-Gruwel et al., 2009; Walraven et al., 2008) who invest greater thought and time to planning, generate more complex and lengthy searches (Rosman, Mayer, & Krampen, 2016b), and regulate their problem-solving behaviour through strategic regulation, including orientation to the task, and monitoring and steering their progress (Brand-Gruwel et al., 2005). According to Glaser (1992), a novice learner, on the other hand, relies on superficial features of problems and rushes to execute solutions based on “smaller, less articulated, more literal and surface-oriented” patterns of meaning with limited relation to abstract principles of knowledge (p. 68). This conduct is consistent with Gulf higher education learners’ information problem-solving behaviour (Bendriss et al., 2015; Holliday & Li, 2004; Martin, 2016), and may indicate that they lack the schema and skills for effective information problem-solving. Simply put, it suggests that Gulf learners are *novice* information problem-solvers. Sweller’s cognitive load theory (CLT) explains human cognitive architecture and can frame instructional interventions to support learners’



development from novice to intermediate level problem-solving, and the initial formation of expert-like schema (Sweller, 1994; Sweller, van Merriënboer, & Paas, 1998).

### **Cognitive Load Theory**

Sweller and colleagues' research over recent decades has examined the constraints on working memory that can impact the effectiveness of instruction (Sweller, van Merriënboer, & Paas, 1998). Cognitive load theory suggests that constraints, or loads, on cognition come in the form of three types of cognitive load (CL), extraneous, intrinsic, and germane (Sweller et al., 1998). Extraneous CL refers to suboptimal mental processes that neither contribute to schema development nor are necessary to the learning objectives (Diao & Sweller, 2007; Kalyuga, 2011; Leppink et al., 2014). Intrinsic and germane cognitive load represent, respectively, the amount, complexity, and interactivity of information elements to be learned (Ayres & Paas, 2009; Paas, Renkl, & Sweller, 2004; Sweller, 2010) and learners' relevant prior knowledge in long-term memory (DeLeeuw & Mayer, 2008; Leppink et al., 2014). For optimal learning, then, instruction should be designed, organized, and facilitated in a way that minimizes or eliminates extraneous cognitive load (Sweller et al., 1998) to free limited cognitive capacity to devote to intrinsic and germane cognitive load (F. Paas, van Gog, & Sweller, 2010).

To repeat, cognitive capacity is limited (F. Paas, van Gog, & Sweller, 2010). Recent estimates by Cowan (2001) estimate that we are capable of thinking about no more than three or four new elements at one time. When this is exceeded, according to Clark, Yates, Early, and Moulton (2010), learner anxiety further reduces capacity and this leads to slowed learning and often, loss of focus. Thus, it is crucial to consider cognitive

load in instructional design to minimize overload or extraneous information that may distract learners from the target conceptual or procedural knowledge (Clark et al., 2010).

To illustrate the role of cognitive load in learning, consider problem-based learning for beginners who lack the schema associated with the target learning domain. Problem-based learning (PBL) is a minimally guided approach that assumes that students should construct their own solutions to authentic problems, and that knowledge acquisition occurs as a result of experience of the procedures associated with the particular discipline (Kirschner et al., 2006). Importantly, guidance or support is minimal, and typically provided only if learners elect to use it (Kirschner, et al., 2006). Following a problem-based learning approach, a beginner, or novice, approaches a problem by seeking a solution through a “means-end analysis” (Renkl, 2014, p. 5), incorporating ineffective strategies such as selecting a solution based solely on one word in the problem scenario (termed key word strategy) or merely copying a solution from what they assume is a similar problem (termed copy-and-adapt strategy, Renkl, 2014). These suboptimal mental processes are associated with managing extraneous cognitive load whereby beginners attend to specific problem *features* rather than rely domain *principles* (Renkl & Atkinson, 2007). When learners’ limited working memory shifts away from the domain principles, or underlying schema, and is used solely for the “means” (i.e., solution seeking), there is little or no remaining cognitive capacity to devote to schema building (Renkl, 2014).

**Examples as scaffolds.** Example-based learning, on the other hand, enables students to develop basic understanding of the principles, or rules, of the learning domain through the study of models or examples, which serve as the basis for later problems solving (Renkl, 2014). EBL assists novices in the initial stages of the problem-solving

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process through scaffolding, a socio-constructivist notion of adequate guidance or support during the learning process. In the initial stages of cognitive learning, examples provide scaffolds that relieve learners of the burden of solving problems when they lack the schema and other cognitive strategies to do so effectively and efficiently (Renkl, 2011; Renkl, 2014). Over time, scaffolding can be gradually withdrawn, enabling learners to progress more independently as their competence increases (Hemmati & Mortazavi, 2017).

Educational and cognitive psychologists have researched example-based learning, originally termed learning-by-example, since the 1950s to understand the optimal instructional activities to select, present, and sequence examples so that learners can attend to and discern the underlying concepts, principles, or patterns of a learning domain (Atkinson, Derry, Renkl, & Wortham, 2000; Renkl, 2011). In the 1980s, research on the pedagogical aspects of concept, or schema, formation contrasted example-based learning with problem-based learning, or a problem-solving approach (Sweller, Ayres, & Kalyuga, 2011). On the one hand, findings from this research led to the conclusion that example cases “provide an expert’s problem-solving model for the learner to study and emulate” (Atkinson et al., 2000, pp. 181-2). As described above, this type of scaffolding enables the novice learner to devote available cognitive capacity to schema building which transfers beyond the solution or procedure provided (Sweller et al., 1998). Problem-based learning, on the other hand, was found to impose a significant load on working memory, i.e., extraneous cognitive load, for novices due to the absence of scaffolds. Again, this forces learners to rely on weak and ineffective problem-solving strategies to reach a

solution, with little or no remaining cognitive capacity for schema building (Renkl, 2014; van Gog & Rummel, 2010).

Combined with explicit instruction, the use of worked examples reduces working memory, or cognitive load, and may lead to what is known as the worked example effect (Sweller, 2016), an empirical effect from cognitive load theory. Along with the over seven decades of empirical support for example-based learning, there is also extensive research that suggests that when learners receive the solution to a problem, they outperform their peers who must solve the problem themselves, as with problem-based and other less scaffolded learning approaches (Cooper & Sweller, 1987; Renkl & Atkinson, 2003; Renkl, 2014). Sweller (2016) argues that, on the basis of the worked example effect alone, empirical research “overwhelmingly favors” (p. 362) explicit instruction with example solutions in educational contexts where information or target knowledge and skills are novel.

#### **Renkl’s (2014) Example-Based Learning**

Alexander Renkl’s (2014) integrative, instructionally oriented theory of example-based learning frames the instructional use of both written and enacted representations of expert solutions in the form of worked examples, models, and analogs. These representations feature prominently in cognitive skills development in the first two phases of Renkl’s (2014) four-part EBL instructional model, *principle encoding* and *relying on analogs* (Renkl, 2014), and represent particularly effective scaffolds for Gulf learners’ novice-level information problem-solving schema and skills. That is, learning from examples is well-matched to Gulf learners’ particular preference and capacity for emulation (Bashir-Ali, 2011; Souleles, 2013).

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In phase one, principle encoding, the learner acquires simple declarative knowledge of the target domain principle such as a rule or theorem through direct instruction (abstract principle method), multiple examples (embedded principle method), or a combination thereof (Renkl, 2014). Examples typically contain:

- an initial problem state, i.e., the formulation of the problem or statement of the task (Renkl & Atkinson, 2007);
- the givens, or elements of the problem in the form of diagrams, data, and figures (Sweller, 1994);
- the goal state, or desired or target resolution of the problem, or in the case of a task, the end product, or ‘deliverable’, much like traditional problems and tasks in course books (Renkl, 2014);
- solution steps or a demonstration account of how the problem could or should be solved to achieve the goal state (Renkl, 2002; Renkl & Atkinson, 2007); and
- the solution or end product itself (Renkl, 2002; Renkl & Atkinson, 2007; Schworm & Renkl, 2007; van Gog & Rummel, 2010).

Learners develop awareness of abstract solution principles, or schema, by observing these concrete cases of worked examples or solution processes in written or enacted form, when they are performed by an expert (e.g., master, or teacher) or coping (e.g., peer) model (van Gog & Rummel, 2010).

Awareness of learning domain principles is a starting point of schema acquisition, a process which relies on effective exploitation of worked examples (van Gog & Rummel, 2010). Thus, in phase two - *relying on analogs* – example-based learning instruction orients learners’ attention to the abstract underlying principles, most often through

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prompting to explain or to compare examples (Renkl, 2014). This step represents a turning point, as the principle becomes salient and, in some cases, more concrete, to the learner. According to Renkl and Atkinson (2003), novice learners must actively notice, identify, and begin to explain the underlying principles of the target domain in order to build the requisite schema to transition from novice to intermediate levels.

These two initial phases of Renkl's (2014) example-based learning model, principle encoding and relying on analogs, draw on instructional exploitation of worked examples, observational learning, and analogous reasoning to trigger initial schema development and preliminary problem-solving skills. Together, phases one and two may represent an opportunity to meet Gulf students and academic staff where they are, and to build on their preferred teaching and learning approaches and strengths.

Example-based learning scaffolds the learning process through direct instruction of the learning domain principles and guided orientation to its more concrete instances using model written solutions and enacted demonstrations. EBL's exploitation of both written and enacted examples may be consistent with Gulf learners' strength in emulation. In addition, Gulf students' preferred learning approach is consistent with a teacher-centred approach, which characterizes the adjustment academic staff make to their instruction when they arrive in the Gulf. The review of empirical literature below synthesizes studies that are particularly relevant to these factors, and informs the indigenization of Renkl's (2014) EBL model to develop Gulf higher education students' information problem-solving skills.

### **Example-based Learning for Complex, Ill-structured Domains**

Example-based learning research has traditionally focused on well-structured learning domains such as math, science, technology (Kyun, Kalyuga, & Sweller, 2013; Renkl, 2011) and others with algorithmic solutions (Renkl & Atkinson, 2007; Schworm & Renkl, 2007). Although researchers have begun to investigate EBL in such diverse ill-structured domains such as essay writing (Kyun et al., 2013), heuristic strategies (Renkl et al., 2009), journal writing (Hübner, Nückles, & Renkl, 2010; Roelle, Kruger, Jansen, & Berthold, 2012), visual literacy (Rourke & Sweller, 2009), and customer counselling (Cattaneo & Boldrini, 2016), studies investigating of the use of EBL for information problem-solving is extremely scarce (J. Frèrejean, personal communication, March 20, 2017), and equally limited in second or foreign language settings.

#### **Information Problem-solving and Complex Learning**

Information problem-solving in personal, academic, and workplace environments requires a set of complex functional and cognitive skills (Brand-Gruwel et al., 2005; Cyphert & Lyle, 2016; Lloyd, 2003; Rosman et al., 2016a; Walton & Hepworth, 2011). Information problems arise “when a discrepancy occurs between information needed to answer a certain question and information already known” (Walraven, Brand-Gruwel, & Boshuizen, 2009, p. 235), and lie on a continuum from well-structured to ill-structured. Wopereis, Brand-Gruwel, and Vermetten (2008) illustrate this continuum by contrasting fact-finding and information retrieval tasks at the well-structured end of the scale with analyzing and synthesizing multiple resources to develop a literature review at the ill-structured, complex end. In addition, due to the almost exclusive reliance on the World Wide Web for information (Gross & Latham, 2012; Smith et al., 2013) and the

information overload it generates (Saunders, 2012), solving both well- and ill-structured information problems tends to occur in ill-defined information spaces, leading to uncertain and potentially overloaded cognitive states (Bowler, 2010). Complexity is also linked to content levels, whereby complex learning domains generally have two content levels, the learning domain (target skill or knowledge) and the exemplifying domain (topic used for illustration of the learning domain) (Atkinson & Renkl, 2007; Renkl et al., 2009; Schworm & Renkl, 2007). Renkl et al. (2009) describe this as a double-content example, while its classical counterpart is called a single-content example, as it has only one content level. For Gulf higher education students, complexity and the cognitive load associated with information problem-solving is further encumbered by moderating factors of low English language proficiency, including reading and writing (Belhiah & Elhami, 2015; Kim, 2015; McLean et al., 2013), limitations in background knowledge (Hatherley-Greene, 2014; Khelifa, 2009), and limited skills and experience with IPS, as well as with information and communications technology and libraries (N. Johnston et al., 2015; Lightfoot, 2015; Martin, 2016; Wiseman et al., 2014).

**Complexity, language proficiency, and working memory.** Managing complexity and minimizing performance demands for novice learners whose English language proficiency may be weak are important considerations in managing cognitive load. In this case, learning in English represents a complex, double-content (in some cases, multi-content) learning domain given the reduction of working memory while learning in a second or foreign language (Diao & Sweller, 2007). Broadly speaking, second language processing – be it production or comprehension – draws on more cognitive resources, including working memory, than processing in one’s first language (Linck, Osthus,



Koeth, & Bunting, 2014). For Gulf learners who have extensive experience memorizing information in education settings (Davidson, 2010; Ridge, 2014), one would expect that a stronger memory capacity might mitigate lower English proficiency levels in academic performance. However, Linck et al.'s (2014) meta-analysis of 79 studies related to working memory and second language processing found that second language learners with higher working memory capacity exhibited no significant processing advantages. The 'double content' burden on second language learners' working memory combined with low or limited schema in the learning domain, places heavy demands on real-time processing (Diao & Sweller, 2007; Lin & Chen, 2006) and can lead to foreign language anxiety (Horwitz, Horwitz, & Cope, 1986).

Research by I. Chen & Chang (2009) has found that learners with higher foreign language anxiety experience increased cognitive loads and decreased performance. In higher education settings where English is a second or foreign language (ES/FL), anxiety associated with limited language proficiency and content knowledge can negatively affect already burdened cognitive loads as well as achievement (Horwitz, 2016). The additional compromises to non-native speakers' cognitive load and anxiety underscores the mitigating value of a whole task approach and its potential to provide a broad introduction to the learning domain to establish initial schema without imposing further cognitive load. Research findings of the implementation of other example-based learning components with foreign language (FL) learners portray a mix of both opportunities and caveats.

**Whole task approach to manage complexity.** Recent research on information problem-solving in higher education has led to recommendations for a whole-task

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approach, beginning with simplified versions of the entire task (Brand-Gruwel et al., 2005; Frèrejean et al., 2016) followed by authentic information searches, and gradual increases in complexity (Rosman et al., 2016a). However, for novice learners, holistic or whole task approaches can pose a “severe risk... because they are overwhelmed by the task complexity” (van Merriënboer, Jeroen J. G, Kirschner, & Kester, 2003, p 5) and its cognitive demands (Renkl, 2014). Empirical studies conducted across technical and academic fields in general (van Merriënboer, Clark, & de Croock, 2002) and in information problem-solving specifically (Frèrejean et al., 2016; Wopereis et al., 2015) suggest that, for novices, complementing a holistic instructional approach with concrete examples of the target skills and knowledge (Frèrejean et al., 2016) may mitigate this risk. These instructional acts are consistent with example-based learning. The overview is necessarily didactic (as with direct instruction) and frees learners from performance demands as required, for example, by problem-based learning. In addition, scaffolded use of tangible examples enables opportunities for schema building prior to more independent problem-solving (Renkl, 2014; van Gog & Rummel, 2010).

**Analogies represent common ground.** Recall that Renkl’s (2014) abstract principle method incorporates direct instruction to convey basic declarative knowledge of new principles or concepts for novice learners (Roelle, Hiller, Berthold, & Rumann, 2017). For Gulf learners, this type of instructor-led approach will be familiar, while the principles and concepts of the learning domain, information problem-solving, is likely to be *unfamiliar* (Diallo, 2014; Romanowski & Nasser, 2015; Souleles, 2013; Wheeler & Anderson, 2010), which may lead to anxiety and add to their cognitive load. The abstract principle method may be especially effective in abating the increase in learners’ cognitive

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load according to Renkl (2014), who notes that analogies can provide an initial template, or schema to augment understanding. In addition, it is likely that English as a foreign language (EFL) learners are already experienced in this mode of thinking in their first language, as analogical reasoning relies on examples or cases that are already known (Renkl, 2014). As Glaser (1992) explains, experts search for analogies as part of a default process when they are faced with ill-structured problems, suggesting that this process exists among a wide variety of cultures and types of expertise, and is not an exclusively Western construct or behaviour. Thus, it is highly likely that EFL students rely on this form of reasoning in their own language because the use of analogy and its sub-component, metaphor, are default processes for many and prevalent in language use as well as learning and problem-solving in general. The use of analogic reasoning to manage learners' cognitive load or even to extend learners' understanding as part of problem-solving with Gulf learners who have low English proficiency is likely to be effective in introducing and reinforcing new principles and concepts of the target domain.

In the learning domain of second language acquisition, research by MacLennan (1994) and Wylie, Koedinger, and Mitamura (2010) found mixed results in learning from the instructional exploitation of analogs and metaphors. On the one hand, MacLennan's (1994) extensive review of research on metaphor and prototype instruction with English language learning indicates that, while English metaphors can be both confusing and incomprehensible to non-native speakers of English, it represents a principal rhetorical form of language that is processed automatically (analogously) by native speakers (expert users) of English and is therefore crucial for English language development. Students of English as a foreign language seldom if ever experience explicit or satisfactory

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introduction to the extensive use of metaphors in English despite its potential to “simplify tedious learning processes and to reduce the cognitive load” (MacLennan, 1994, p. 108). On the other hand, Wylie et al.’s (2010) study examined the direct instruction of analogic reasoning comparison for a highly prescriptive, specific aspect of English, the English article system, and found that it did *not* lead to enhanced results, or at least no more so than the other condition, self-explanation with practice, discussed below. Wylie et al. (2010) suggest that, in cases of well-structured, less complex learning domains with few solution steps such as prescriptive grammar, deep processing such as with analogous reasoning may not be effective. Instead, they suggest, analogous reasoning may be better suited for learning in more complex contexts that involve a broader skills base such as reading, writing, and the arts.

Research by Gregory, Hardiman, Yarmolinskaya, Rinne, and Limb (2013) and Simons (1984) confirms Wylie et al.’s (2010) assertion of the role of analogy in deep processing within complex domains. Simons’ (1984) study investigated the use of analogies in reading instruction for high school students in the Netherlands in their first language and found that, although this process increased instructional time, it was highly effective and the analogies served as scaffolds for both encoding and retrieval, leading to superior performance in comprehension. A review of creativity research by Gregory et al. (2013), also found that the guided study of analogies leads to deeper processing that builds enhanced adaptive expertise, however they caution that it may be better suited for learners with sufficient content knowledge. Thus, for Gulf learners who are novices in the learning domain, information problem-solving, and have limited proficiency in the medium of instruction, English, careful selection of a familiar exemplifying domain is

necessary. If this condition is met, it is more likely that the use of analogs and analogous reasoning as scaffolds in teacher-led instruction will contribute to building initial templates or schema of the target domain, according to Renkl's (2014) example-based learning model.

**Worked examples.** The most common and extensively researched example of the use of analogs in example-based learning is the use of worked examples, also termed worked out examples, enacted examples, models, and model solutions. For novices, worked examples scaffolded by instructional guidance can result in enhanced learning of problem-solving principles and procedures, especially compared to traditional problem-based instruction that may offer little or no guidance (Kirschner et al., 2006; Sweller & Cooper, 1985). In addition, research on the use of worked examples “presents one of the strongest data sets supporting this approach” especially in well-structured domains (O. Chen, Kalyuga, & Sweller, 2015). In more complex domains, worked examples can be either written or enacted models of the learning domain.

**Written models.** Findings from studies of German and Korean university students' writing by Hübner et al. (2010) and Kyun et al. (2013) respectively suggest the beneficial role of the combined use of models and direct instruction. In both studies, results suggest greater gains in knowledge and skill for participants who received models (worked examples) of the writing. Kyun et al.'s study (2013), in which higher education students wrote in English, a foreign language for them, the difference in performance between participants who received the model and those in the no treatment group was significant ( $p = .01$ ). Similarly, high school students in Hübner et al.'s (2010) study who received a model journal outperformed their peers in the no-example group in the transfer session,

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one week following treatment. Further, Hübner et al.'s (2010) experiment found that instruction that orients or draws learners' attention to cognitive and meta-cognitive strategies may have even more impact on the long-term retention of complex higher order skills when illustrated and reinforced with an example. Importantly, strategy instruction without examples was actually detrimental to performance while participants' use of examples alone (i.e., without strategy instruction) seemed sufficient for participants' transfer of metacognitive strategies (Hübner et al., 2010). Interestingly, findings from Kyun et al.'s (2013) three experiments indicate a negative correlation between levels of expertise and achievement. That is, the lower the initial skill level, the greater the learning gains, a finding that is consistent with cognitive load theory whereby novice learners benefit more from example-based learning than those with more expertise, who instead tend to experience greater gains with less guided or scaffolded learning and problem-solving (Kalyuga, Ayres, Chandler, & Sweller, 2003; Renkl, 2014). These findings from complex domains using written worked examples are compelling, and emerging research suggests that metacognitive strategies and other academic skills may be even better illustrated through 'live' or enacted models.

***Enacted models.*** Observational learning is a type of example-based learning that involves the illustrative use of enacted or modeled experiences to facilitate learners' awareness of how a skill or behaviour should be performed (Renkl, 2014; Zimmerman & Kitsantas, 2002). van Gog & Rummel (2010) explain that while worked examples exploit primarily written accounts of problem-solving processes and are the focus of cognitive research, enacted, modeling or observation examples (used interchangeably herein) demonstrate process and/or procedural performances and are based theoretically on

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Bandura's (1986) social cognitive research. With enacted examples, learners observe the model's behaviour, and often hear their thought processes or descriptions as they think aloud during the experience (Renkl, 2014). In this way, learners become aware of the consequences of the model's actions and learn how to perform the skill in order to later emulate the behaviour and achieve similar outcomes (Zimmerman & Kitsantas, 2002). Bandura's (1986) concept of vicarious capability frames understanding of individuals' advanced capacity to acquire and encode rules of behaviour through the highly efficient mode of observing others. This capacity enables much more productive learning without sacrificing self-regulatory capability, or alertness to discrepancies between an observed behaviour or performance and an internally driven standard (Bandura, 1986). Renkl (2014) argues that this learning mechanism also functions effectively in complex processes of academic skill acquisition.

For Gulf learners from an Arab-Islamic academic culture transitioning into Western academic environments observational learning may offer similarly effective, efficient schema and initial skill development opportunities. The use of enacted models also draws on Gulf learners' well-established skill of emulation, linked to rote learning (Bashir-Ali, 2011; Souleles, 2013). Studies from the domain of writing development once again offer empirical support for example-based learning with both well- and ill-structured problems, at the syntactic (less complex) and argumentative (more complex) levels of writing.

Although from diverse academic settings, studies by Braaksma, Rijlaarsdam, and van den Bergh (2002) and Zimmerman and Kitsantas (2002) have come to similarly favourable conclusions about the use of enacted models, or observational learning, to teach the complex skill of academic writing. In both studies, participants received direct

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instruction followed by enacted problem-solving by two types of models, expert and weak, termed mastery and coping respectively. Coping models commit and self-correct errors and other impasses, illustrating their confusion and hesitations, and improving their performances to gradually overcome them and build confidence. Mastery models, conversely, demonstrate rapid, smooth, mostly error-free learning, often verbalizing positive and confident attitudes throughout the performance (Braaksma et al., 2002; Zimmerman & Kitsantas, 2002). Results from both studies confirm the similarity hypothesis (Braaksma et al., 2002) whereby the observed model's similarity to learners in terms of competence levels impacts learning positively. That is, stronger models in Braaksma et al.'s (2002) study had a greater impact on stronger participants' achievement, while weaker models in both studies had more favourable impacts on weaker, or struggling participants. Braaksma et al., 2002 note that, particularly for weak learners, cognitive effort shifts from the heavier burden of performance to a focus on learning from others and acquiring new understandings, in this case initial schema related to the cognitive skills of argumentative writing. Based on these findings Gulf learners may benefit from enacted examples by a peer, rather than an instructor.

Mastery and coping models for the learning domain of peer review, a similarly complex evaluative and cognitive skill, was the focus of Min's (2016) investigation with non-native speakers of English in Taiwan. All participants received direct instruction and a demonstration of peer review, and different experimental groups later observed mastery or coping models. In contrast to the similarity hypothesis findings from Zimmerman and Kitsantas (2002) and Braaksma et al. (2002), results indicate that observation of a mastery model led to significantly greater learning gains than the other treatment groups,



who viewed a coping model. This may indicate that EFL learners much like Gulf learners from government K-12 learning environments may benefit more from observing the systematic, clear, accurate performances of expert models in the initial stages of cognitive skill acquisition, unlike the proficient learners (in English) in the Zimmerman and Kitsantas (2002) study and native speakers in Braaksma et al.'s (2002).

Min (2016) argues that the expert model's "clear and flawless demonstration provided systematic, unobstructed messages... rendering it easier for many to attend to and learn the modeled steps" (p. 52). Returning to the notion of the 'double content' burden on second language learners' working memory (Diao & Sweller, 2007; Lin & Chen, 2006), perhaps the cognitive load borne by learning in a second language from two areas, a learning and exemplifying domain, is mitigated, or at least not overburdened, by mastery models. Observing coping models, on the other hand, may involve an additional performance load of recognizing and identifying errors, which may have negative or less successful learning outcomes. These empirical findings suggest that, in the initial learning stages of complex learning (involving two domains), EFL learners may benefit from observing mastery models of performance to lower the burden on cognitive load.

**Orienting activities.** Written worked examples and observational learning offer clear and accurate model solutions for non-native speakers of English and other learners with diverse academic cultures (i.e., not from Western education backgrounds). Merely studying or observing worked examples is insufficient, however. An integral aspect of efficient and effective exploitation of examples, models, and analogs is orientation, or awareness-raising activities to draw attention to principles of the learning domain and their application in problem-solving (Renkl, 2014). Learners' attention must be drawn to

the underlying rationale or principles of an example, and one way this can be accomplished effectively is through training or prompting to self-explain the observed solution steps (Renkl & Atkinson, 2010).

***Self-explanation.*** Exploiting concrete examples to develop abstract example-independent knowledge, or schema, can depend on how well learners are able to explain the rationale of the example solution in one of three ways, spontaneously, through training (e.g., example comparison), or in response to self-explanation prompts (Chi, Bassok, Lewis, Reimann, & Glaser, 1989; Renkl, 2002; Renkl, 2014). This phenomenon is known as the self-explanation effect (Chi et al., 1989; Schworm & Renkl, 2007). In Chi et al.'s (1989) seminal think aloud protocol experiment, students shared their thinking as they examined worked solutions from the book and then tried to solve isomorphic problems, after having read and studied the subject matter from a physics course book. The researchers found that stronger students (based on grade point average and scholastic achievement test scores) tend to explain examples more frequently than weaker students. Stronger students also had greater learning gains despite having equally low levels of prior knowledge of the physics subject matter, or learning domain. Findings suggest that these spontaneous self-explanations lead not only to a better problem-solving procedure, but also to more complete understanding of the underlying principles (Chi et al., 1989, p. 169). Renkl's (1997) findings from a similar study which analyzed think aloud protocol data of first-year university students' probability calculations found that, independently and without prompting, the majority of participants lacked adequate self-explanation strategies, resulting in unsuccessful learning. Even among the minority of

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good self-explainers - and more successful learners - certain features of principle-based explanations were missing or faulty.

Two studies with students of foreign languages, English and Chinese respectively, illustrate the potential for self-explanation for low or limited proficiency learners. A study by Lin and Chen (2006) at a Taiwanese university compared two types of scaffolds which drew the EFL learners' attention to "essential and relevant elements of the new material" (p. 427): learner generated self-explanation and the provision of descriptive advance organizers. Participants who received the self-explanation prompts (termed advance organizer questions by the researchers) outperformed the advance organizer group in comprehension of the exemplifying domain, physiology of the human heart. Participants in Chang, Lee, Su, and Wang's (2016) study, learning beginner Chinese grammar taught in the medium of English, received instructional descriptions of how and when to use the target grammar along with sample sentences (worked examples). As part of the computer-assisted language learning instruction, participants were prompted to either self-explain the feedback to incorrect answers or simply move to the next question. As with the Lin and Chen (2006) study, the self-explanation group outperformed those who simply advanced to the next task. Qualitative data from the experimental group indicate that self-explanations lead learners to not only clarify their misconceptions but also to identify key characteristics of correct examples (Chang et al., 2016).

Importantly, orientation activities that prompt self-explanations have the potential to increase cognitive load beyond the capacity of working memory (Sweller, 2006). In the Chang et al. (2016) study, it is important to note that participants were proficient in English, the language of both instruction and self-explanation. This is important to

consider in light of the earlier discussion on working memory and second language learning as it relates to Gulf higher education environments, where learners' first language (L1) is Arabic. In addition, in the same study, self-explanation prompts were woven into post-solution steps analysis by the experimental group as part of feedback on concept check activities. This additional scaffold may partially explain the absence of significant differences in cognitive load measures (Chang et al., 2016), suggesting reduced extraneous load to optimize the work of intrinsic and germane cognitive load activities such as reflection (Sweller, 2006). For Gulf learners, novice information problem-solvers with limited English proficiency, prompts to self-explain may lead to a strain, or burden, on working memory. Sweller (2006) explains that this can occur when requirements to self-explain force the learner to draw on cognitive load that is already burdened by the novel information elements, resulting in cognitive overload and therefore interference with learning (Sweller, 2006). When learners lack the knowledge or available cognitive resources to accurately self-explain the rationale and/or its related domain principles of the content that they are studying, instructional explanations can provide effective scaffolding and (Hilbert, Renkl, Schworm, Kessler, & Reiss, 2008; Wylie, Koedinger, & Mitamura, 2009).

***Explanation-help.*** Explanation-help, known also as instructional explanation (and referred to interchangeably below), is an expert response to a self-explanation prompt, and is designed to orient the learner to the key underlying principles and critical aspects of a worked example (Hilbert et al., 2008). Importantly, explanation-help must be crafted and presented with learners' background knowledge in mind, according to (Hilbert et al., 2008). In their meta-analysis of 21 empirical studies (Wittwer & Renkl, 2010) found

mixed results in the efficacy of instructional explanations with worked examples. Findings suggest positive effects on the development of conceptual knowledge, but not procedural and overall knowledge (Wittwer & Renkl, 2010). The researchers describe the immediate benefits of instructor explanations as minimal but add that there is potential for long-term retention and transfer based on the positive impact on conceptual knowledge from these learning supports (Wittwer & Renkl, 2010). A similarly indirect benefit of instructional prompts was found in Schworm and Renkl's (2006) study comparing self-explanation with instructional explanation for teacher trainees. Their results indicate a paradox in which self-explanation prompts had measurably superior effects on learning outcomes, whereas instructional prompts led to superior or more positive perceptions of learning outcomes. As with the Wittwer and Renkl (2010) findings, Schworm and Renkl's (2006) results may represent an underlying metacognitive component to instructional explanations that may boost or positively impact outcomes in ways that are less obvious and therefore more challenging to operationalize and measure. That is, given the empirical support for their positive impact on conceptual learning, complemented by evidence of learners' more positive views of their learning than with self-explanation prompts, instructional explanations may have both an affective and cognitive component that builds both confidence and performance.

Renkl and Atkinson (2007) point out that, in comparison to self-explanation, explanation-help can be more suitable and effective in cases where learners may not be able to sufficiently explain a solution step, or where their self-explanation may be incorrect. Nonetheless, these research findings suggest potential for schema and skill development for novices as a result of self-explanation and explanation-help orienting

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activities that prompt awareness of underlying principles in written or enacted worked examples or solutions.

Further, for novice EFL learners, the socio-cognitive approach to modeling the metacognitive skills of expert problem solvers is likely to reduce extraneous cognitive load so that they can devote intrinsic and germane cognitive load to building schema and skills in the learning domain (Renkl & Atkinson, 2010). The analogous reasoning associated with receiving worked examples build on novice learners' vicarious capacity, described earlier, and reduces the burden on working memory and cognition from having to solve a problem without requisite principles or scaffolds. Gulf higher education students face challenges in English proficiency and background knowledge but excel in activities where they respond to direct instruction and that require emulation. Similarly, Gulf higher education academic staff become more teacher-centred in their teaching approach when they arrive in the Gulf and indigenize their instruction for Gulf learner consumption. With these conditions and opportunities in place, example-based learning may represent a viable instructional intervention to support student development of information problem-solving skills and schema.

### **Example-based Learning to Solve Information Problems**

Research examining the explicit implementation of example-based learning to develop information problem-solving competencies does not exist (J. Frèrejean, personal communication, March 20, 2017). Nonetheless, findings from skills decomposition studies (Brand-Gruwel et al., 2017; Brand-Gruwel et al., 2005; Brand-Gruwel et al., 2009) and IPS-related cognitive load research (Rosman et al., 2016a) suggest a role for a holistic, whole task approach incorporating EBL-like instructional elements. Two

recently published studies in European higher education institutions with distinct features of example-based learning reveal promising results for this type of intervention.

Studies by Wopereis et al., 2015 and Frèrejean et al. (2016) explored online learning programs for undergraduate students to develop information problem-solving skills. Frèrejean et al.'s (2016) experiment contrasted the use of task supports, namely completion tasks (a problem with a partial solution) and emphasis manipulation (self-explanation prompts of fragments of the modeling example) in isolation and in combination. These treatments followed direct instruction and a ten-minute modeling example by an expert, and were implemented with four learning tasks, or problems, to solve. Results indicate no significant differences among the experimental groups and the control group, an initially surprising finding that Frèrejean et al.'s (2016) hypothesize can be explained by a learning effect drawn from all groups' observation of the expert model.

The study by Wopereis et al., 2015, on the other hand, implemented a common example-based learning instructional technique known as backward fading, which the researchers described as completion strategy in which solution step scaffolds, or learning supports, are progressively reduced, and learners must then gradually engage in the problem-solving steps. Often, as the name suggests, backward fading starts with removal of the last step, an approach similar to the completion tasks of the Frèrejean et al. (2016) experiment. Because each subsequent example requires more learner involvement, the authors point out that this strategy has positive effects on transfer and inductive learning. Wopereis et al. (2015) found that students perceived two other aspects of the treatment, cognitive feedback on their performance and instructional support (instructional prompts and expert model enactments) as most helpful. Interesting parallels exist with previously

discussed studies, namely that learners have positive perceptions of the value of instructional support (Schworm & Renkl, 2006), and achieved gains in conceptual knowledge (Wittwer & Renkl, 2010).

These IPS experiments incorporating elements of example-based learning indicate promising instructional principles and practices that, in combination with findings from more mainstream EBL applied research, may be implemented in Gulf higher education contexts.

#### **Conclusion**

While the theoretical, empirical, and recent needs analysis research highlights limitations and deficits in Gulf learners' learning approach, English language proficiency, background knowledge, and experience with ICT, library, and other information problem-solving tools, example-based learning appears to represent promising instructional practices matched with learners' distinct academic culture. To illustrate, direct instruction in the initial EBL instructional phases is tailored to Gulf learners' preference for didactic teaching. Careful study of and attention-orienting scaffolds for written and modeled examples build naturally on learners' tendency for emulation and memorization. Prompts to draw attention to underlying principles address learners' passive approach to learning. And finally, instructional scaffolds such as whole task overviews of content, with multiple examples and opportunities to practice with feedback provide extensive cognitive support to help learners manage the cognitive burden associated with learning a novel domain such as information problem-solving. Much like the students in studies by Schworm and Renkl (2006) and Wittwer and Renkl (2010) learners may respond to and value the affective and conceptual knowledge benefits most.



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For academic staff, example-based learning may also meet them “where they are” given their reported adjustment to more teacher-centred instruction in the Gulf. For those who may lack the pedagogical and information literacy skills to assist students with information problem-solving, example-based learning offers theoretical and applied research support to structure and guide their instructional efforts related to IPS, and to facilitate a principled transition from an initial approach that is teacher-centred to a more learner-centred approach characterized more by instructional *guidance*.

Bruce (2002) asserts that information problem-solving education that “requires explicit attention to information processes... and careful crafting of real world information practices, and meaningful reflection” (p. 12) has the potential to go beyond surface learning to empower learners through deep learning. A holistic, process oriented approach, underpinned by example-based learning, draws learners’ attention to the “how” and “why” – strategies and principles – of authentic expert problem-solving (van Gog, Paas, & van Merriënboer, 2004). From an instructional view, example-based learning pedagogy controls the type, volume, and duration of these elements as they interact in working and long term memory (F. Paas et al., 2010). For Arabic-speakers with non-Western background knowledge and a distinct academic culture, solving information problems through analytical reading and writing in English presents a significant burden on working memory and sizeable, possibly unmanageable, cognitive load. To reduce this load for Gulf learners, an instructional intervention is planned for IPS instruction using elements of example-based learning and, initially, subject-matter based on students’ prior knowledge, the UAE’s national multi-sector development strategy, the UAE Vision 2021 (UAE Prime Minister's Office, 2010), required content in high school and in first-year

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programs in government institutions (H. Alshamsi, personal communication, October 2016).

From an instructional perspective, implementation of EBL and awareness of the process of moving from a teacher-centred to a student-centred approach have potential to provide proof of concept to Gulf academic staff and encourage their own use of similar instruction based on Cognitive Load Theory.

### **Chapter Four: The Intervention Research Plan**

In her UNESCO white paper, Bruce (2002) stated that information literacy (IL) has emerged as “the critical literacy for the twenty-first century” and, in an era of continuous technological development, “information literacy education is the catalyst required to transform the information society of today into the learning society of tomorrow” (p. 1). To transform Gulf higher education, example-based learning (EBL) may be an effective framework for the information literacy catalyst as a bridge for Eastern and Western approaches to teaching and learning. EBL has the potential to match students’ tendency for emulation in their learning with academic staff’s inclination towards an instructor-led approach in their Gulf higher education teaching. Its suitability for developing information problem solving skills, a sub-skill of information literacy, is a promising, empirically supported opportunity to investigate. Empirical support also exists with comparable studies.

According to Hill, Bloom, Black, and Lipsey (2008) and Lipsey et al. (2012), effect sizes from interventions that are similar and implemented under comparable conditions offer an empirical benchmark that is both representative and appropriate for norming. Empirical research on the use of example-based learning to facilitate information problem solving development, as discussed, is extremely scarce, so findings from EBL studies using orienting activities such as self-explanation and explanation-help represent suitably similar research designs from which to draw effect size data. Effect size calculations using Wilson’s (2001) Practical Meta-Analysis Effect Size Calculator and findings from a modest research synthesis suggest a range of expected effect sizes in the

current experimental study from 0.43 to 0.72 for self-explanation, and 0.44 to 0.50 for the explanation-help condition.

For self-explanation treatment studies, the most representative study comes from research by Frèrejean et al. (2016) in which features of EBL are used to develop information problem solving. Findings suggest an effect size of 0.43 for the self-explanation group. Further, results from Hefter et al.'s (2014) study of self-explanation to develop argumentation skills indicate an effect size of 0.50, while Chang, Lee, Su, and Wang's (2016) EBL-based study of self-explanation to develop Chinese grammar knowledge yielded an effect size of 0.72. On the other hand, findings from explanation-help research (more commonly termed instructor explanation) that reflect similar conditions to the current study are less common. Results from seminal research by Renkl (2002) and Schworm and Renkl (2006) offer points of comparison with effect size ranging from 0.50 and 0.44 respectively.

These effect size ranges may suggest statistical power at the higher end (e.g., 0.72), however there may not be sufficient similarity with the current experiment. Importantly, the most similar study by Frèrejean et al. (2016) is at the low end of the effect size range. Nonetheless, power analyses using the program *G\*Power* (Faul, Erdfelder, Lang, & Buchner, 2007) indicate that sample size from 15 to 36 may be sufficient for similar results for the current study. That is, with a potential sample size of 150 (5 class sections of up to 30 participants each), this calculated sample size range, based on similar empirical research, appears to be both realistic and feasible.

Notwithstanding these favourable findings, to further minimize the possibility of an inferential error, Lipsey and Hurley (2013) suggest careful consideration of other evidence, including prior research, to indicate effect. For the current study, research by Frèrejean et al. (2016) offers alternative evidence of effect in terms of self-explanation. Additionally, qualitative data in the current study in the form of student evaluation of learning, as well as my observations and journal entries offer another. Table 11 summarizes these data related to effect and sample sizes.

Table 11

*Summary of effect size research synthesis*

Condition	Effect size	Sample size
self-explanation	0.43 – 0.72	15 to 36
explanation-help	0.44 – 0.50	

### **Study Purpose and Research Questions**

The main purpose of this embedded mixed methods study is to facilitate development of the initial skills and schema associated with information problem solving (Brand-Gruwel et al., 2009) by implementing Renkl's (2014) instructionally oriented theory of example-based learning (EBL). The secondary purpose is to gather proof of concept for Gulf academic staff of transitioning from a teacher-led to student-centred approach using EBL. These outcomes form the basis of the four research questions:

1. What changes occur in participants' IPS skills as a result of receiving worked examples?

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2. Is there a difference in achievement of IPS skills among the participants who receive one of the two variations of the treatment condition (EBL instruction with self-explanation or explanation-help scaffolds) and the control group, who received no treatment?
3. Is there a difference in IPS behaviour as a result of receiving worked examples?
4. What results emerge from comparing the exploratory qualitative data about participants' evaluation of learning and qualitative data about implementing the intervention with outcome quantitative data measured on the IPS skill instrument?

### **Research Design**

To answer these research questions, the study follows an embedded mixed methods design, combining qualitative data collection and analysis within a traditional quantitative research design (Creswell & Plano Clark, 2011) - in this case a regular pre-test / post-test experiment with three conditions, described below. Although the primary purpose of the experiment is to assess whether the effect of the treatment was significant, a single data set would be insufficient to answer the secondary research questions, the experience and process of the intervention. An embedded mixed methods design facilitates the use of secondary qualitative data to identify emergent issues associated with implementing the primary quantitative design (Creswell & Plano Clark, 2011). That is, qualitative data from the instructor (the author) and participants about the implementation and experience of example-based learning to develop information problem-solving schema and skills complements the quantitative measures of the achievement of IPS schema and skills.

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This combination frames a more in-depth understanding of the instructional intervention and its effect on the target learning domain.

In line with the mixed methods research design, program evaluation involves a dual focus, incorporating both qualitative and quantitative research processes. A process evaluation will examine the degree to which the instructional intervention was implemented with fidelity and will involve quantitative and qualitative data collection and analysis. An outcome evaluation will examine the effect of the instructional intervention, following a quantitative design.

The following questions frame the process and outcome evaluations.

- Process evaluation: Have the necessary components of Renkl's (2014) instructionally oriented theory of example-based learning (EBL) been implemented adequately to facilitate schema and skills development of the first two steps of Brand-Gruwel et al.'s (2009) model of information problem-solving, defining the problem and information search?
- Outcome evaluation: Was there a difference in achievement of information problem-solving skills and Internet behaviour between the clusters who received one of the two variations of the treatment condition (EBL instruction with self-explanation or explanation-help scaffolds) and the control group, who received no treatment?

### **Process Evaluation**

As both researcher and instructor in the study, I have taken on the design, development, and implementation of the intervention, including instruction and materials. Thus, evaluation of the intervention processes relies on various resources in an attempt to

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maintain objectivity. This broad set of responsibilities and the dual roles are guided by instructional, theoretical, and empirical resources related to the instructional intervention, Renkl's (2014) EBL model and the learning domain principles, schema, and skills of Brand-Gruwel et al.'s (2009) IPS model. These frameworks form the basis from which indigenization, or adaptation, will take place in the process of implementing the intervention in a novel context.

**Fidelity of implementation.** The working definition of fidelity of implementation for this study is the adherence, or consistency, of implementation, determined in part by the presence of distinguishing or critical features (Dusenbury, Brannigan, Falco, & Hansen, 2003) and core components (Nelson, Cordray, Hulleman, Darrow, & Sommer, 2012) of the intervention. Nelson et al. (2012) argue that this begins with explicit identification thereof. The three critical features and core components of the intervention are: (1) implementation of the instructional intervention, the first two phases of Renkl's (2014) instructional theory of example-based learning, to facilitate schema and skills development of (2) the target learning domain principles, defining the problem and information search, of the information problem-solving model (Brand-Gruwel et al., 2009), and (3) participants' full attendance in intervention-related sessions.

**Fidelity criteria.** Dusenbury et al. (2003) outline five indicators of fidelity of implementation, and the current process evaluation encompasses three: adherence, dose, and program differentiation. Strict adherence involves conformity to theoretical guidelines "particularly when the intervention is adapted to meet the needs of special circumstances" (Dusenbury et al., 2003, p. 240). Adaptation of the EBL intervention will take the form of indigenization, also referred to as domestication, which Phillips and



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Ochs (2004) explain occurs when external features of another model or system are absorbed and ultimately synthesized into the strategy or regular practice of the borrower context. The indigenization process is consistent with Dusenbury et al.'s (2003) depiction of adaptive, responsive planning, tailored training, and local materials development, all of which describe indigenizing activities. Indigenizing activities will draw on inputs that reflect and adhere to the theoretical guidelines of Renkl's (2014) model and include instructional (e.g., from Clark, Nguyen, and Sweller, 2006), theoretical (e.g., from Chi et al., 1989), and empirical (e.g., from Frèrejean et al., 2016) resources. In addition, to meet students' learning needs as well as the course objectives at the Middle East higher education institution (MEHEI)<sup>5</sup>, tailoring, or indigenization draws also on my knowledge and experience of Gulf learners' academic culture (K-12 experience), English language proficiency level, and information problem-solving knowledge and skill levels.

These conditions reflect high fidelity of adherence to the intervention protocol and theoretical framework. Low fidelity would encompass *not* abiding by one or more of the critical features and components of Renkl's (2014) EBL model or deviating from a focus on the IPS learning domain during the indigenizing and implementation processes.

The second criterion for fidelity is dose, or the amount of treatment the participants receive (Dusenbury et al., 2003). High fidelity reflects conditions where all participants attend each lesson related to the intervention, and take part in the intervention learning activities as designed. The intervention learning activities facilitate *individual* development of target learning domain schema and skills. Therefore, independent participation during intervention-related lessons is also crucial for high fidelity.

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<sup>5</sup> This is the term required by the institution in which the study will be conducted.

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Conversely, incomplete attendance at intervention-related classes, or reliance on or extensively collaboration with others, would result in low to moderate fidelity, depending on the amount of lessons missed and the extent of collaboration.

Finally, program differentiation is the third indicator of fidelity. According to Dusenbury et al. (2003), program differentiation enables the researcher to transcend the “black box approach” (p. 244) through efforts to identify and explain those elements of fidelity linked to immediate outcomes. Distinguishing among the three study conditions – self-explanation, explanation-help, and control (no treatment) - is therefore crucial. This will require distinct differentiation of instruction between the control and treatment groups, with normal, ‘business as usual’ instruction for the former, and Renkl’s (2014) example-based learning for the latter. Further, empirical findings from the current study related to implementing two different but related principles of Renkl’s (2014) model, self-explanation and explanation-help, may inform which orienting activity is essential to the learning context.

High fidelity requires clearly delineating the intervention conditions of the three experimental groups and ensuring consistent application of EBL within groups (i.e., between the two class sections in each treatment group). Low fidelity, on the other hand, would be indicated by overlap of experimental conditions among the three groups, or inconsistent application within.

***Fidelity Measures.*** Measuring the three fidelity indicators, adherence, dose, and program differentiation, involves several qualitative and quantitative measurement tools.

*Adherence: Self-report and self-observe.* Self-report and observation are two common measures of adherence to the critical components of an intervention (Dusenbury

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et al., 2003). Self-report will rely primarily on an adherence checklist found in Appendix B, which outlines both the critical elements of the intervention and the learning domain principles, and frames the three conditions of self-explanation, explanation-help, and control. The adherence checklist will provide a scaffold during implementation as a road map for the study, and a guide for adherence efforts. I will refer to and annotate the checklist regularly during implementation.

On the other hand, self-observation will require a different mechanism. Playing both researcher and instructor roles in the study requires what Nesbit (2012) terms iterative reflection, a sense-making strategy that Thiel, Bagdasarov, Harkrider, Johnson, and Mumford (2012) suggest establishes thoughtful sensitivity and thorough attention to the myriad cultural dimensions (House, Javidan, Hanges, & Dorfman, 2002) of the research context, especially in the indigenization activities. Dusenbury et al.'s (2003) observation criterion for fidelity will be sought through iterative reflection and maintaining a reflective instructional journal. Journal entries will describe observations, decisions, and reflections related to implementation of the intervention. These data represent more in-depth, specific documentation of adherence to the crucial components of the intervention, and complement the more binary nature of information gathered in the adherence checklist (e.g., present/absent, completed/not completed). That is, while the adherence checklist reflects more quantitative indicators of fidelity of implementation, the journal provides richer, more descriptive qualitative depiction of the intervention processes.

*Dose: Full participant participation.* For high fidelity of dose, participants must engage in all intervention-related example-based learning activities as designed. As

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described earlier, this means that they must attend all relevant classes and complete the intervention activities independently. Institutional attendance records, entered online after each 100-minute class session, will indicate learner attendance during intervention-related classes. In addition, to these data, the instructional journal will include observations about anomalies in participation behaviour, for example specific participants' efforts to collaborate with others (e.g., including activity type and if possible, nature and duration of collaboration). Finally, I will annotate the treatment schedule (see Appendix C), illustrating both planned and actual implementation.

***Program differentiation: Distinct conditions.*** To clearly differentiate among the three treatment conditions, a colour-coded schedule of the week's class sessions will provide a concrete, visual sign post for daily and weekly planning (see Appendix D). In addition, completing the adherence checklist and journal, and annotating the treatment schedule each week will contribute to regular orientation to the distinct and crucial components of each of the treatment conditions. The reflective component of the journal also provides an opportunity to express affective and evaluative reactions to implementing the intervention with fidelity, including facilitating different learning conditions for different groups.

From the participants' perspective, there is potential for communication, comparison, and collaboration across class sections and potentially, across the three treatment groups, self-explanation, explanation-help, and control (no treatment). This would threaten fidelity of treatment as participants from one condition might share their learning materials (e.g., the enacted worked example) with participants from another (e.g., the control group, who receive no worked examples). To reduce this threat to

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fidelity, availability of treatment-related resources will be managed diligently through the learning management system (LMS) grouping and access functions. That is, resources will be available only during class times for the duration of the treatment period.

These processes and data collection mechanisms, summarized in Table 12, below, contribute to fidelity of treatment and inform the research questions that address implementation and experience. Similarly, an outcome evaluation plan frames additional data collection and processes which inform the primary research question regarding the effect of the intervention on participant achievement.

Table 12

### *Fidelity Measures, Tools, and Criteria*

Fidelity indicator	Measure	Tool (Appendix)	Fidelity criteria
Adherence	Self-report	<ul style="list-style-type: none"> <li>Adherence checklist (B)</li> </ul>	Full adherence to the intervention protocol and theoretical framework
	Self-observation	<ul style="list-style-type: none"> <li>Reflective instructional journal</li> </ul>	
Dose	Attendance	<ul style="list-style-type: none"> <li>MEHEI attendance records</li> </ul>	Full attendance at each intervention lesson
	Participation	<ul style="list-style-type: none"> <li>Reflective instructional journal</li> <li>Treatment schedule (C)</li> </ul>	Participation as designed
Differentiation	Distinct conditions	<ul style="list-style-type: none"> <li>Colour-coded class schedule (D)</li> <li>Adherence checklist (B)</li> <li>Reflective instructional journal</li> <li>Treatment schedule (C)</li> </ul>	<p>Clear delineation of 3 conditions of intervention (SEG, EHG, CTRL)</p> <p>Consistent application within groups</p>

### **Outcome Evaluation**

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Recall that the outcome evaluation is framed by the question, *Is there a difference in achievement of information problem-solving skills and Internet behaviour between the clusters who received one of the two variations of the treatment condition (EBL instruction with self-explanation or explanation-help scaffolds) and the control group, who received no treatment?* Addressing this question will draw on achievement data from pre-test, post-test, and retention measures of information problem-solving skills test, and participant self-ratings on the pre-test (baseline) and retention IPS behaviour survey. Rounding out the outcome evaluation to enable a better understanding of the experience of the intervention for students and the instructor, and to contribute to proof of concept, the research questions, once again, are:

- What changes occur in participants' IPS skills as a result of receiving worked examples?
- Is there a difference in achievement of IPS skills among the participants who receive one of the two variations of the treatment condition (EBL instruction with self-explanation or explanation-help scaffolds) and the control group, who received no treatment?
- Is there a difference in IPS behaviour as a result of receiving worked examples?
- What results emerge from comparing the exploratory qualitative data about participants' evaluation of learning and qualitative data about implementing the intervention with outcome quantitative data measured on the IPS skill instrument?

The next section describes the method for achieving the purposes of the study, implementing and evaluating Renkl's (2014) example-based learning to develop Gulf

higher education students' information problem-solving schema and skills, and gathering proof of concept for Gulf academic staff.

## **Method**

### **Participants**

Participants are female Emirati undergraduate (bachelors) students at a gender-segregated campus of the MEHEI, enrolled in one of five sections of an introductory undergraduate scientific research methods course. Arabic is the first language of all students at the MEHEI, whereas English is the medium of instruction (except for Emirati studies courses in the general studies program). Thus, students will have achieved a minimum overall score 5.0 on the International English Language Testing System (IELTS) academic module, or its institutionally accepted equivalent<sup>6</sup> to matriculate.

### **Measures**

**Independent variable: The intervention treatment.** The instructional intervention, Renkl's (2014) example-based learning and the orienting activities of self-explanation and explanation-help, form the independent variables of the study. To determine any correlation between the three experimental conditions, self-explanation, explanation-help, and control (no treatment), and changes in the dependent variables, IPS skills, requires adequate fidelity. Evaluation of fidelity of adherence, dose, and program differentiation, including measures, is described above in Process Evaluation. For statistical analysis purposes, participants will be coded by number to indicate which of the three treatment conditions they received.

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<sup>6</sup> CEFR/CFR band B2, or CEPA English Test Score 180, or Cambridge Certificate in Advanced English test score 41, or TOEFL iBT 61, OR TOEFL PBT 500, TOEFL CBT 173

**Dependent variable 1: Information problem-solving skills.** The first two steps of information problem-solving, *defining the problem* and *searching for information* (Brand-Gruwel et al., 2009) represent the learning domain for the treatment and development of these schema and skills form the proximal outcomes of the study, as depicted in the logic model in Appendix F. Figure 4, replicated from the previous chapter illustrates the IPS skills, sub-skills and regulation activities (behaviour).

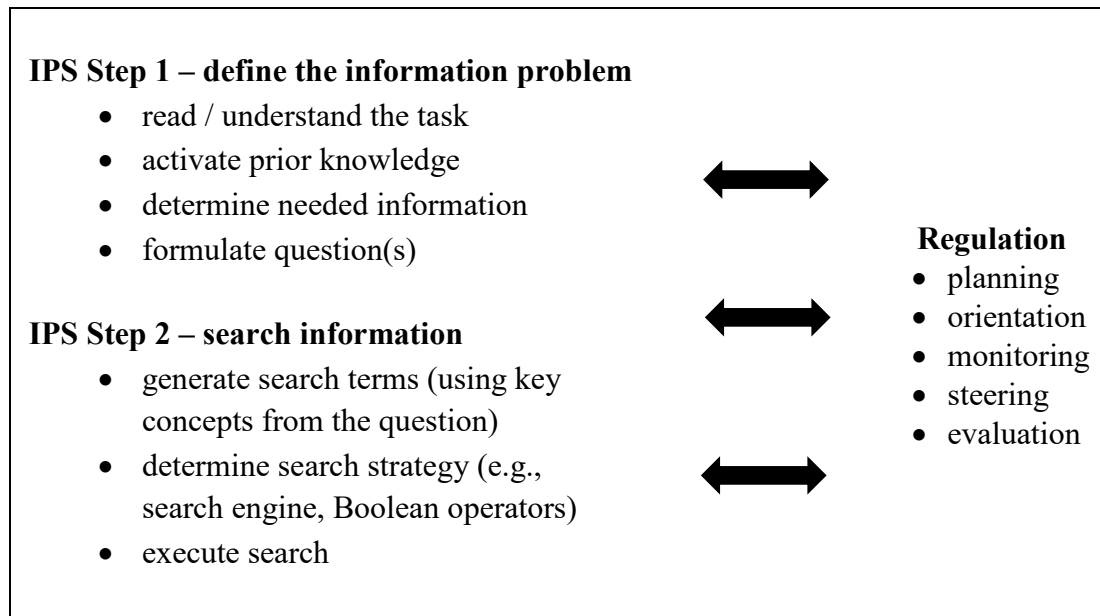


Figure 4. IPS steps 1 and 2 and regulation activities.

Note: adapted from “A descriptive model of information problem-solving while using Internet,” by S. Brand-Gruwel, I. Wopereis, and A. Walraven, 2005, *Computers & Education*, 53(4), pp. 1207-1217.

The information problem-solving skills measurement tool (referred to herein as the IPS skills test) has been adapted from the first three items of Frèrejean et al.’s (2016) study, and targets the first two steps of the IPS process. Each test has an isomorphic academic essay-writing prompt that replicates the type of information problem they would face in the learning context, the Middle East Higher Education Institution (MEHEI). As



with Frèrejean et al.’s (2016) study, the online instrument is designed to capture students’ performance levels of the IPS skills without them having to complete the actual research task. Each of the four tests was identical in its design and structure, including the bilingual (Arabic-English) instructions. For authenticity, per the instructional norms in the MEHEI, essay-writing prompts are in English only. After reading the prompt, participants construct responses related to the first two steps of IPS. Respondents had access to the Internet during the test, and worked independently.

The IPS skills test comprises three of the original seven items from Frèrejean et al.’s (2016) IPS test. Appendix H provides IPS skills test shell and the four prompts, while Figure 5, below, provides the pre-test prompt and the three items as an example.

Assignment	<i>The Arabian Gulf has more and more visitors each year from all around the world. How does this affect the culture of the Gulf? Gulf economy? The environment? Write a 750-word essay about this issue using at least three high quality sources. Format your essay with APA.</i>
Item 1 – define information problem	How would you <u>start</u> this assignment? What is your <u>first step</u> to do this work, and <u>why</u> ?
Item 2 – formulate question	What do you have to do, exactly? Explain the assignment <u>in your own words</u> .
Item 3 – search terms and strategy	What would you type into Google?

Figure 5. IPS skills pre-test.

**Dependent variable 2: IPS behaviour.** Another online survey has been developed with Qualtrics to measure IPS behaviour. The IPS behaviour survey is

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adapted from items drawn from previously validated instruments<sup>7</sup> (Frèrejean et al., 2016; Greenberg & Bar-Ilan, 2014; Timmers & Glas, 2010) and supplemented with original items that align with target IPS skills, sub-skills, and regulation activities. Forced response items elicit participants' self-report of their approaches to information problem-solving in the first two steps of defining the problem and searching for information, including self-regulation and use of support systems used in the process (e.g., Google Translate, Wikipedia, asking a friend). Supplemental items fill gaps in the empirical research on information literacy and IPS measurement. For example, Timmers and Glas (2010) were not able to find a study that targeted the initial stage of IPS, defining the task.

Items also indirectly elicit aspects of participants' academic culture, for example passive learning (i.e., relying on a friend for instructions rather than asking the instructor). Participants will indicate their behaviour using a frequency scale (*always, often, sometimes, never, or what is that / don't know*) or indicating level agreement (*strongly disagree to strongly agree*). The final item targets participants' perceived level of competence using the Internet on a scale from 1= *extremely low* to 10 = *expert*. Participants will complete the bilingual (Arabic-English) IPS behaviour survey at pre-test, in week two of the course, and again at retention, in week 15.

Table 13 summarizes the two independent variables and their measures.

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<sup>7</sup> In her recent extensive review of information literacy measurement research (Catalano, 2016) states that the development and validation of IL tests is a weakness in the field of library and information sciences, citing weak research methods as one cause. Nonetheless, she reviews and recommends two of the instruments (Greenberg & Bar-Ilan, 2014; Timmers & Glas, 2010) that are relevant to and included (adapted) for the current study.

Table 13

*Independent Variables and Measures*

Independent Variable	Measures
Information problem-solving skills performance	IPS skills test 1 (pre-test), 2 (post-test 1), 3 (post-test 2), and 4 (retention)
Information problem-solving behaviour	IPS behaviour survey 1 (pre-test) and 2 (retention)

**Dependent mediating variables: Mental effort.** Information problem-solving represents a complex problem in an ill-defined domain (Frèrejean et al., 2016; Rouet, 2009). Example-based learning scaffolds the demands placed on cognitive load during problem-solving (Renkl et al., 2009; Renkl, 2011; van Gog & Rummel, 2010), and may reduce the burden or load on working memory, as depicted in the theory of treatment in Appendix E. After both treatments, targeting IPS skills one and two, participants will complete a one-item online mental effort survey to indicate their perceived cognitive load related to the just-completed treatment, answering the question, *How much effort did it take to perform this task?* (9-point scale, 1 = *very, very low mental effort*, 9 = *very, very high mental effort*). The Mental effort survey, created using Qualtrics, was adapted from Frèrejean et al. (2016) and F. G. Paas (1992).

**Independent moderating variables.** Three variables associated with Gulf learners' academic culture, discussed earlier in the literature review and needs analysis study, have potential to moderate the strength of relationship between the instructional intervention, Renkl's (2014) instructionally oriented example-based learning framework (independent variable), and the expected outcome, development of the learning domain principles of the first two steps of information problem-solving

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(Brand-Gruwel et al., 2009), dependent variable. The independent moderating variables are: K-12 learning background, English language proficiency, and information literacy background (experience with ICT, libraries) and behaviour (approach to solving information problems). As illustrated in Table 14, these data will come from a combination of institutional sources and participant self-report.

Table 14

### *Independent moderating variables and data sources*

Independent Moderating Variable	Data Source
K-12 learning experience <ul style="list-style-type: none"><li>• type (public, private)</li><li>• dominant medium of instruction</li></ul>	Participant self-report via background survey
English language proficiency	MEHEI records (existing data)
Information literacy background	Participant self-report via background survey
Information problem-solving behaviour	Participant self-report via information problem-solving behaviour survey, week two

Participants will complete an online bilingual (Arabic-English) background survey, developed with Qualtrics, in week one of the course, and provide background information about their high school and MEHEI experiences, including the type of high school (public or private) and its dominant language of instruction. MEHEI data will provide participants' English proficiency at the time of joining the institution, as measured by the national English language proficiency assessment. Some records (scores) are up to four years old, depending on the participants' year of registration. The background survey will

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also elicit participants' information literacy background via Likert scale items of the frequency and type of experience with information literacy resources (information communications technology (ICT), the library, and the Internet) to solve information problems in high school, as well as at the MEHEI. This will be a one-time measure of IL background. Finally, participants will indicate their information problem-solving behaviour in a bilingual (Arabic-English) online survey adapted from relevant validated instruments used in similar higher education settings (Frèrejean et al., 2016; Greenberg & Bar-Ilan, 2014; Timmers & Glas, 2010). Participants will complete the IPS behaviour survey at the beginning and end of the course (pre-test, retention). Table 15 provides an overview of the data gathering plan to address the outcome evaluation question.

Table 15

*Data Gathering Schedule and Overview*

Time	Variable	Measure / Source
Pre-test (baseline)	Independent variable (IV) 1: IPS schema and skills	IPS skills test 1
	IV 2: IPS behaviour	IPS behaviour survey 1, Background survey
	Independent moderating variable: K-12 background, English proficiency, and information literacy background	Background survey MEHEI data
<b>[Treatment 1 - IPS skill 1]</b>		
Post-test 1	IV 1: IPS schema and skills	IPS skills test 2
	Mental effort	Mental effort 1
<b>[Treatment 2 -IPS skill 2]</b>		
Post-test 2	IV 1: IPS schema and skills	IPS skills test 3
	Mental effort	Mental effort 2
Retention	IV 1: IPS schema and skills	IPS skills test 4
	IV 2: IPS behaviour	IPS behaviour survey 2

**Procedure**

**Recruitment and sampling.** In the first week of classes, students in each of the five class sections will view a brief (3-minute) recruitment video in Arabic (recorded by an Emirati instructor at the MEHEI) to ensure comprehension of the key aspects of participation. These include allowing one's data to be used with the guarantee that anonymity, choice, and the option to withdraw at any time remained for the duration of the course. Students will receive two Arabic consent forms, one for themselves and

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another for their guardian (parent or husband), according to local cultural norms. Students view the Arabic-language recruitment video at least twice during the first three weeks of class.

This experimental study with three conditions involves a cluster randomized trial with randomization based on class size and a covariate of interest, English language proficiency. Cluster randomization trials randomize groups to interventions rather than individuals, often in contexts such as schools where the treatment by its nature is implemented at the cluster level (Lewsey, 2004). In the MEHEI, class sections are determined by student registration and remain intact for the semester, so to improve baseline balance, stratified random assignment will determine control and treatment conditions, as recommended by Torgerson and Torgerson (2007). Assigning conditions in this way enables statistical control for the moderating variables, including English proficiency (C. Bryant, personal communication, 25 April 2017). This represents a restricted allocation method which, according to Torgerson, Torgerson, and Taylor (2010), may contribute to the precision of the experiment. Torgerson et al. (2010) report that randomized controlled trials are considered the “gold-standard method in evaluation research” (p. 144) because of the possibility of making causal inferences based on what Shadish, Cook, and Campbell (2002) term unbiased estimates of effect. Further, according to Shadish et al. (2002) randomization reduces the likelihood that confounding variables can be correlated with the treatment experienced by the group, or cluster. The stratification design element enhances the balance of factors identified as prognostic at baseline, and may also increase statistical power (Lewsey, 2004). Although the number of randomized clusters is quite small, Lewsey (2004) argues that the “stratifying

randomized design will have greater power than the completely randomized design” (p. 898).

**Intervention.** This experimental study will engage four class sections of MEHEI students in example-based learning (treatment condition) and one section in traditional or standard instruction (control condition) to build information problem-solving schema and skills. The main features of the instructional intervention are: a whole task approach, building on background knowledge of the exemplifying domain, direct instruction of the learning domain principles, exploitation of worked examples (enacted and written), attention-orienting activities through self-explanation prompts and explanation-help prompts, practice (learning tasks with feedback), and problem-solving (of the course assignment). Figure 6, below, illustrates the intervention as designed, incorporating a whole task approach and direct instruction for all participants, followed by treatment for the two groups based on the orienting activity they experience (self-explanation or explanation-help) using two worked examples related to problem scenarios one and two. The control group will simply be completing the two problem scenarios as learning activities. Finally, all groups will complete learning activities with problem scenarios three and four. This sequence will be completed for both treatments, IPS skill one and two. (See Appendix J for the scenarios).



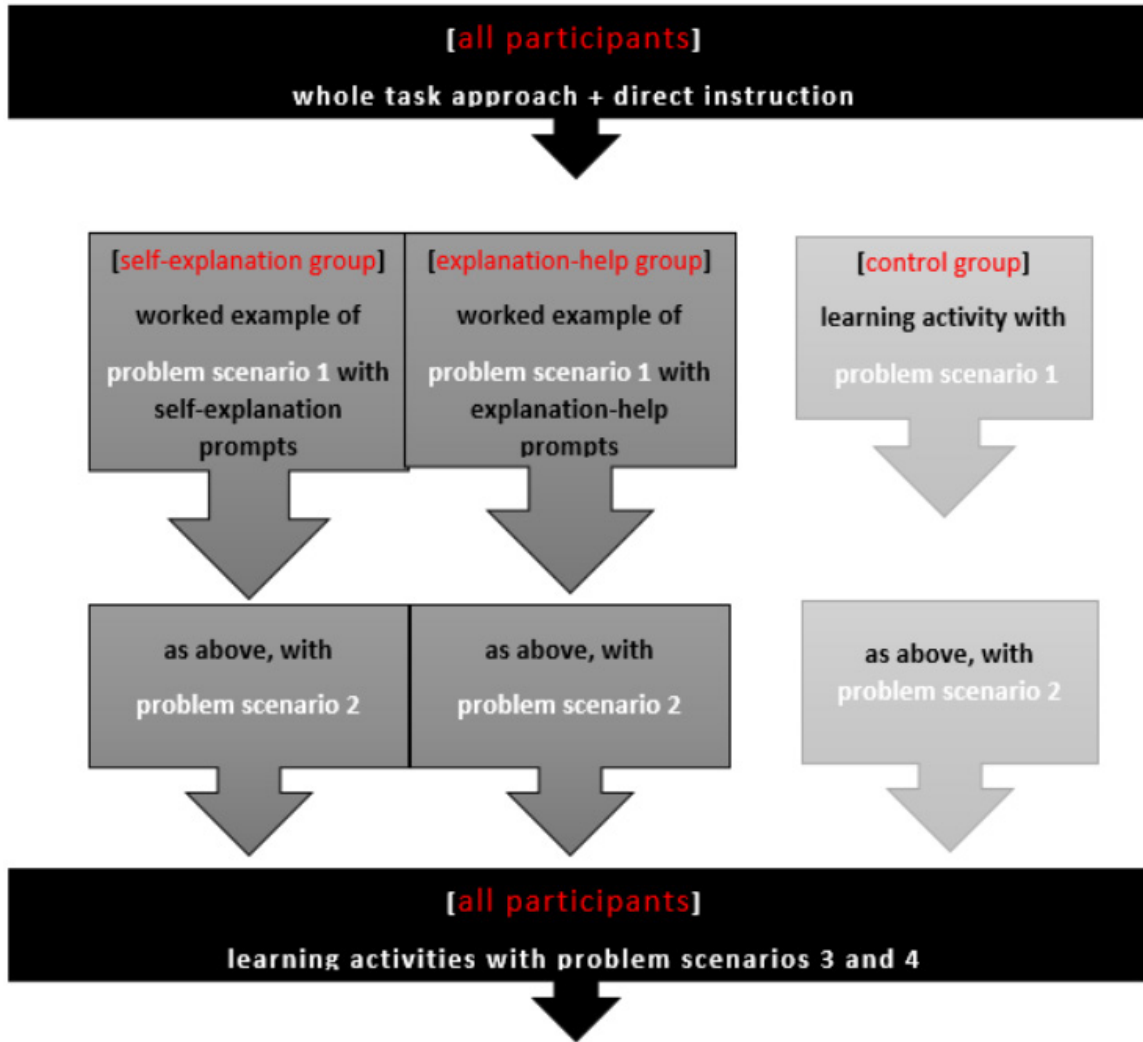


Figure 6. Example-based learning intervention design (one treatment).

**Whole task approach.** In the initial two weeks of the Fall 2017 semester, instruction will follow a “big picture learning design”, termed *holistic* by IPS researchers Brand-Gruwel et al. (2009) and Rosman et al. (2016a) to introduce the course on basic methods of scientific research, the exemplifying domain (Vision 2021 and the MEHEI graduate outcomes), and the knowledge, skills, and dispositions associated with the scientific research cycle. Videos, discussions, bi-lingual Internet resource access, note-taking, and formative evaluations of the exemplifying domain will be accompanied by a

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sample of a complete scientific research paper as a concrete example of the product of research students will produce. This *whole task* introduction, complemented by regular comprehension and concept checks, feedback, and remedial learning activities, is designed to establish a global understanding of the course as well as its exemplifying domain and the target learning domain and will form a basis on which to build new content and establish links. According to Hardiman (2012), a holistic instructional practice enhances memory and comprehension of concepts and scaffolds problem-solving. During the intervention, learners will be regularly oriented to the broader course outcomes and the iterative research cycle, which are novel learning domain principles, through individual, group, and whole class activities.

**Establishing background/prior knowledge.** As explained in the previous chapter, information problem-solving instruction using example-based learning with subject-matter based on students' prior knowledge is likely to lessen extraneous cognitive load and enable IPS schema and skill development (DeLeeuw & Mayer, 2008; Leppink, Paas, van Gog, van der Vleuten, & van Merriënboer, 2014). Following the whole task introduction, participants will develop common background knowledge of the exemplifying domain for the course assignment (a research paper), the country's strategic development plan, the UAE Vision 2021 (UAE Prime Minister's Office, 2010) through note-taking from independent Internet searches, including bilingual online materials, reading excerpts from designated research papers, and examining primary sources. While the actual problems to be solved for the course will be based on the UAE Vision 2021, learners will also consult additional content from the MEHEI graduate outcomes as part of both background knowledge and potential solutions to the problems they will address

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in their own research work. Participants will also access bilingual online materials related to the graduate outcomes. The four problems utilized in the treatment and practice materials will form the options students choose for their assessed research activities in the course. That is, the same four problem scenarios related to Vision 2021 will be used in direct instruction, the worked examples, and the practice problems. Students will choose one problem scenario to continue working on for their course work. This enables exploitation of worked examples and learning tasks using isomorphic problem scenarios based on familiar content (exemplifying domain). (See Appendix J for the problem scenarios.)

**Direct instruction.** Once recruitment and stratified random cluster sampling is complete, the first treatment condition begins. All students receive direct instruction, as would be expected in regular, no-treatment class work at the MEHEI. In addition to observing a standard teacher-led presentation with the data projector, students will also receive an infographic of the learning domain principles of the first step of IPS, defining the problem, and its four sub-skills: read/understand the task, activate prior knowledge, determine needed information, and formulate question(s). In this initial stage of instruction, example-based learning is consistent with a traditional, teacher-led approach with the use of direct instruction of target content for novice learners. After reviewing the learning domain principles of IPS step one, the control and treatment groups receive problem scenario one.

**Treatment one.** The first intervention activity addresses IPS step one, defining the research problem by iteratively engaging in reading the task for understanding, concretizing the problem by clarifying task requirements and reformulating them,

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activating prior knowledge, and determining needed information (Brand-Gruwel et al., 2009). Intervention activities involve problem scenarios one through four, in order, for each of the three groups, and are delivered to each student individually via the MEHEI learning management system (LMS), Blackboard. This requires that students use their own devices and work independently and arrange their desks ‘exam style’ in rows, separated from others.

Self-explanation and explanation-help group participants individually launch the worked example activity through the LMS and proceed at their own speed through the activities, which use video clips of an enacted worked example illustrating the principles of IPS step one. The enacted worked example is a series of screen cast video clips, created using Camtasia, of a female student depicting the actions (skills) and thoughts (schema) of the first IPS skill by thinking aloud through each of the processes. Each participant in the self-explanation group (SEG) and explanation-help (EHG) groups watch the enacted worked example and work independently, using her own device (e.g., laptop, tablet) or on one of the MEHEI desktop computers and her own headphones. Students also have the option to pause and take notes during the activity, either during the video, or when viewing feedback or other aspects of the interactive tasks.

In the audio-visual recording, the model reads problem scenario one more than once, checks her understanding, highlights key and/or unknown words, activates prior knowledge, opens a Word document and lists key information she thinks she will need to address the problem, and re-states the task in her own words, aloud and in writing. Each of these steps is illustrated in video segments. While the segments of the video are

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identical in content for the self-explanation and explanation-help groups, the tasks are not.

Two types of orienting activity prompts, self-explanation and explanation-help, differentiate the experimental groups. Participants in the self-explanation group (SEG) respond in writing in Blackboard to prompts to explain the actions of model. The first prompt, for example, is, *In the video you just watched, which activities did the student do?* After entering their response, SEG participants receive feedback in the next screen in the form of the correct answer along with a brief explanation. For example, feedback on the first prompt is, *The student read the task more than once. This was her second time reading the task.* The brief explanation below the feedback reads, *Why? She wanted to understand it very well and to find key information.*

Self-explanation group participants are prompted after each brief (maximum 2-minute) segment to describe the solution steps of the modelling that they had just observed in relation to the abstract principles of IPS step one. Recall that these principles will have been introduced in the previous session through direct instruction, and reiterated and reviewed prior to the treatment. This adheres to the self-explanation principle of Renkl's (2014) instructional example-based learning model. Equally consistent with EBL is that participants receive immediate feedback in the form of a brief on-screen text-based correct response and an explanation that restates the principle (e.g., *The student made sure she understood all the key information of the task. She wrote it in her own words.*). When ready, students then advance to the next screen and begin the video segment and task.

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These structured cycles of video-pause-prompt-response-feedback-explanation occur four times, once each for the four IPS step one subskills of *read/understand the task* (e.g., *highlight key words to ask your instructor*), *activate prior knowledge*, *determine needed information*, and *formulate question(s)*. As discussed earlier the IPS steps are also underpinned by self-regulating activities such as orienting to the task, monitoring (e.g., to maintain focus), steering, and evaluation. These were illustrated to varying degrees in the video, but not targeted or oriented explicitly by prompting.

The explanation-help group (EHG) receive identical audio-visual screen cast segments through Blackboard but instead of being prompted to explain the model's actions, they receive text-based instructional explanation prompts, or explanation help, as orienting activities. For consistency, the same feedback and additional explanations from the SEG group activities are provided to the EHG group as instructional explanation prompts. EHG participants are not required to enter any responses in the LMS other than dummy items as part of Blackboard's *test* feature.

In the class session following the initial treatment, both treatment groups receive an additional treatment, an enacted worked example of problem scenario two, isomorphic to one. Differentiation between SEG and EHG is identical to treatment one. Participants then complete two learning activities, 3 and 4 - isomorphic information problems about Vision 2021 and barriers to employment for locals. Just as with problem scenarios one and two, participants complete the learning activities with scenarios 3 and 4 individually, using their own devices and Blackboard. For these two activities, participants receive the PDF version of the scenario via the LMS and respond in writing to questions that elicit the four target IPS step one skills and schema, such as, *In the next question you will get a*

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*document about the research project. How do you start your research project?* After entering their responses in text boxes in the LMS, participants are prompted to imagine that they had to explain the task to their research team at the college in their own words. Yet another prompt asks students to explain what they already know about the topic, and finally, to identify what information their team needs to complete the task. Collectively, these prompts are designed to elicit the sub-skills of IPS step. Once learning activities three and four are completed, students participate in whole class feedback sessions regarding the learning domain, IPS step one, and exemplifying domain in this case, the problem scenarios.

The control group receive the same direct instruction and support materials (digital and paper version of the PDF of IPS step one principles). However, instead of studying the two worked examples, control group participants complete step one of IPS for each of the four problems as learning activities. The learning task activities are identical to the third and fourth problem scenario activities completed by the two treatment groups, described above. Control group participants will not experience the worked examples. The problem scenarios were identical, however, across all groups.

This initial stage of the instructional intervention takes place over four to six 100-minute class sessions, total, for all groups. For all students, these sessions represent a novel approach to completing academic tasks, namely taking time to fully understand and define the research problem. The learning domain, a combination of schema and skills as part of information problem-solving, is complex and ill-defined. The problem scenarios represent what Schworm and Renkl (2007) term double-content examples, as they are from a domain in which no discrete algorithmic solution can be provided and which

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requires consideration of both the learning domain (IPS step one and its sub-skills) and exemplifying domain (the UAE Vision 2021).

**Treatment two.** In the next stage, IPS step two, searching for information, the domain is better defined, given that participants will have recently developed more background knowledge of the exemplifying domain, worked through the task (academic assignment), and produced their own questions as well as lists of required information (derived from step one of IPS). No new problems will be introduced, as IPS step two builds on the schema, skills, and content from IPS 1. For this reason, the next step (and its three sub-skills, *generating search terms*, *determining a search strategy*, and *executing a search*) can be considered well-defined, with more accessible, concrete solutions.

The intervention activities follow the same pattern for each of the three treatment groups as with IPS step one. After another holistic look at the course outcomes and the broader learning domain (information problem-solving), all participants receive direct instruction on creating a search strategy related to an identified information problem, representing the elements of information problem-solving step two. Instead of a classroom presentation, students view an animated video that illustrates the three components (i.e., principles) of searching for information, determining a search strategy, generating search terms and their synonyms from the problem itself, and finally, executing the search systematically, using Boolean operators and parentheses, and adjusting search terms. Once again, consistent with Brand-Gruwel et al.'s (2009) IPS model, the video also depicts the iterative self-regulating aspect of IPS including monitoring of progress and orienting to the task to steer performance.



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Following the holistic overview and direct instruction via video, participants in each of the treatment groups follow the same protocol as described above for treatment one.

**Data collection.** As an embedded mixed-methods design, the study involves both quantitative and qualitative data collection. The experimental portion of the study follows a regular pretest-post-test design with three treatment conditions. Qualitative data includes an adherence checklist, a reflective instructional journal, a treatment schedule, artefacts of teaching and student materials (used, annotated), and student evaluation of the learning experience. Quantitative data include measures of information problem-solving skills, perceptions of IPS behaviour and cognitive load (perceived mental effort), and evaluation of learning. Additionally, quantitative data are available from institutional attendance records, institutional demographic records (English language proficiency scores, K-12 schooling), and responses to the online background survey (K-12 experience, self-reported English language proficiency, and information literacy experience and background). Data gathering begins in the first class session, the week of August 20, 2017, and continue until the penultimate week of the 16-week semester in late November 2017 when retention measures are taken. The treatment schedule in Appendix C illustrates the data collection and intervention implementation schedule.

### **Data analysis.**

Analysis will consist of descriptive statistics, *t*-tests, analysis of variance (ANOVA), analysis of co-variance (ANCOVA), and thematic coding of participant data (IPS skills test scores, IPS behaviour survey, background survey, evaluation of training,

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and mental effort, as well as artefacts from class work and responses to online learning activities) and process data (reflective journal, adherence checklist).

### **Summary Matrix**

The summary matrix in Appendix G outlines the research questions, indicators, data sources, and frequency, and is an overview of the components of evaluation, including process and outcome evaluations. The instruments mentioned in the matrix are included in the appendices. The evaluation will determine whether there is an effect of example-based learning on information problem-solving development with self-explanation prompts, explanation-help prompts. Additionally, it will determine the experiences and processes associated with implementing EBL in a Middle Eastern higher education institution, and provide proof of concept for academic staff in Gulf higher education.

### **Chapter Five: Findings and Discussion**

The purpose of this study was to trial an instructional approach, example-based learning, to develop an essential 21st century skill, information problem solving, in a novel setting, Arabian Gulf higher education. The metaphor of a bridge has emerged in parallel with this purpose. Renkl's (2014) example-based learning instructional framework has potential as a bridge between instructors and students in their cultural border crossing in Western-modeled higher education in the Gulf. Brand-Gruwel et al.'s (2009) information problem-solving model may empower Gulf students with the schema and skills to bridge the knowledge and skills gap and join the knowledge economy. Finally, indigenizing a Western-modeled approach to instruction and to information problem-solving is, in itself, an iterative method of bridging that Phillips and Ochs (2004) characterize as a process of synthesizing external features of one model into the practice of the borrower country (Phillips & Ochs, 2004).

An embedded mixed methods design provides the structural integrity, to extend the bridge metaphor, to pursue the study's purpose through its interlinked quantitative and qualitative research processes, including iterative evidence-based adjustments. This final chapter describes the processes, experiences, and adjustments of the intervention implementation as well as its outcomes, and closes with a forward-facing bridge, connecting findings to theory, research, and practice. Figure 7 below outlines the driving questions to understand the process and outcome of the study.

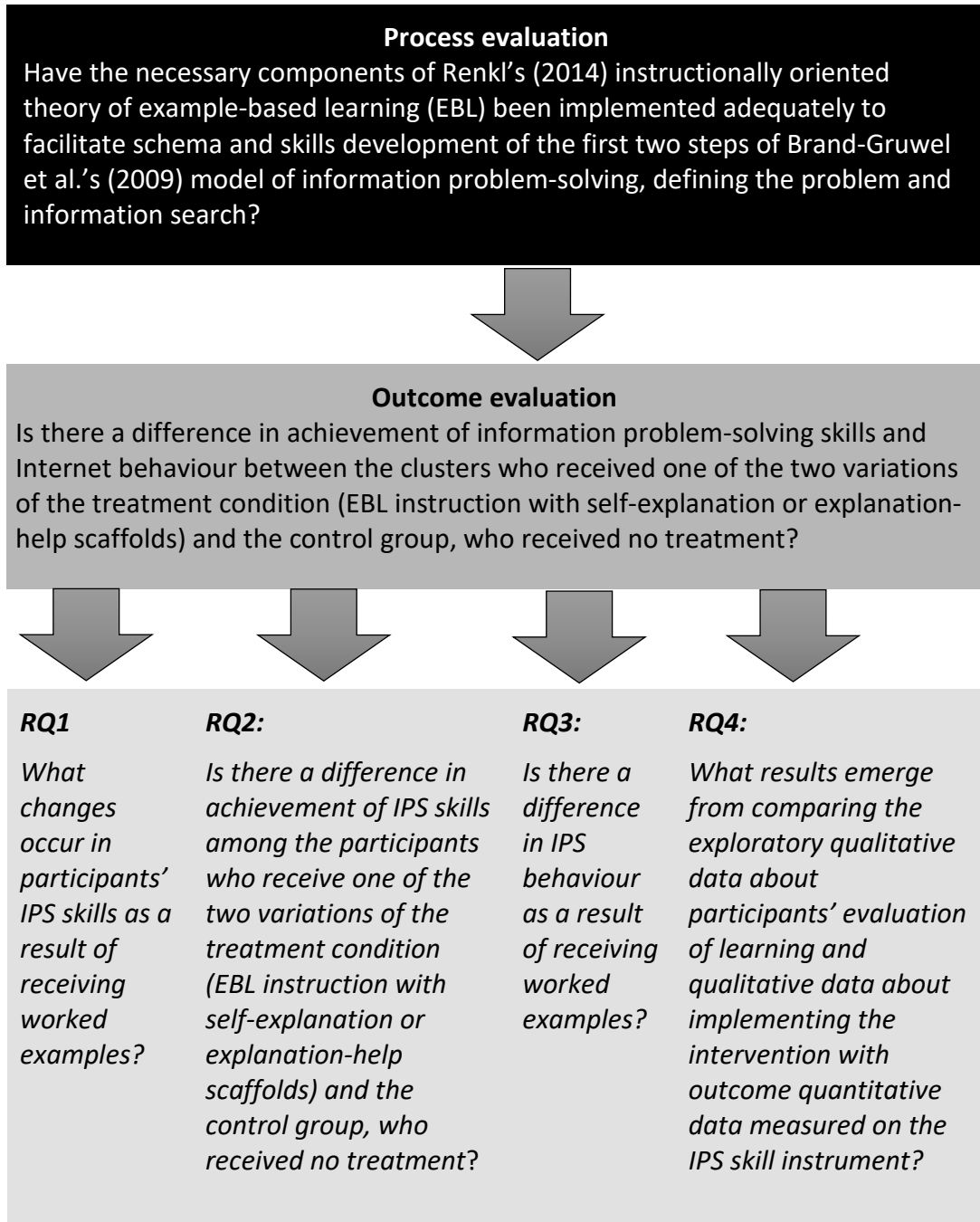


Figure 7. Driving questions of the study: process and outcome evaluation, and research questions.

As the driving questions illustrate, information problem-solving skills form the main construct and dependent variable of focus for the intervention. For this reason, it is important to describe the adaptation and iterative adjustment of the tools to measure and

## Chapter 5 – Findings and Discussion

assess participant performance of IPS skills. As discussed in the previous chapter, the IPS skills test was adapted from the longer, more comprehensive tool used in Frèrejean et al.'s (2016) study. The three items used in the current study are almost identical in wording to the original, and once the IPS skills test was developed, including translations of instructions to Arabic, it was not changed. This was not the case with the rubric to rate participants' performance on the IPS skills test, also adapted from Frèrejean et al. (2016). In their 2016 study, Frèrejean and colleagues developed and validated the rubric in a European higher education setting where participants were proficient in the language of instruction. In the current study, however, once the process of rating and analyzing students' response data began, it became evident that the rubric needed to be adjusted, or indigenized due to validity concerns. Gulf participant responses represented an unexpected range that was not reflected in the lower end of the ratings. This led to consultation with the study advisors and Frèrejean and a decision to make the rubric context specific rather than general. Over time, the iterative and collaborative changes, multiple rating processes, and analyses led to scores that more accurately reflected student achievement of the target schema and skills. As such, it enhanced the validity of the indigenized rubric (see Appendix I) to measure the two IPS steps, defining the problem and searching for information. This reflects one way in which tools from Western settings can be collaboratively adapted and tailored – or indigenized – to maintain its utility and adhere to its original purpose.

### **Process of Implementation**

The study launched on the first day of the fall, 2017 semester, August 20, 2017, following approval from the Middle East Higher Education Institution (MEHEI),

received June 22, 2017, and from the Johns Hopkins Institutional Review Board (IRB), August 19, 2017. As expected, I was assigned five class sections with 119 registered undergraduates of the introductory course on basic methods of scientific research.

**Recruitment, consent, and sampling.** Recruitment began in the initial class sessions of week one of the semester. All 119 students are native speakers of Arabic, and they viewed the Arabic-language recruitment video at least once and received two Arabic consent forms, for themselves and a guardian (parent or husband). Almost 90% ( $n = 106$ ) consented to participate. Table 16 below illustrates the distribution of students into one of the two treatment protocols, example-based learning with self-explanation (SEG) or explanation-help (EHG) orienting activities, or regular instruction in the control (CTRL), or no treatment, group. The two EBL treatment groups were of almost equal size and comprised two class sections each, while the control group made up one class section and was therefore less than half the size. These assignments were based on consent and stratified random sampling, described below.

Table 16

*Intervention Sample and Participant Grouping*

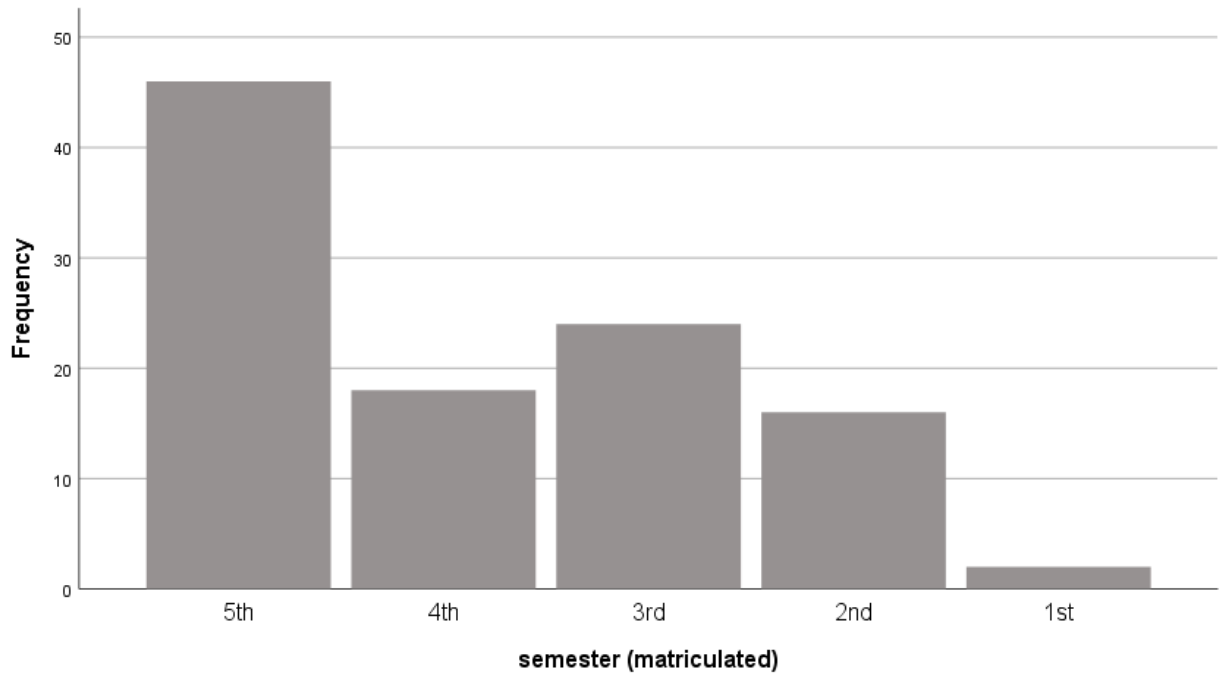
Group	Sample (students)		Participants	
	$n$	%	$n$	%
Self-explanation (SEG)	50	42	44	41.5
Explanation-help (EHG)	50	42	45	42.5
Control (CTRL)	19	16	17	16.0
Total	119	100	106	100.0

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Stratified random sampling was completed in week three of the course in consultation with the study advisors after participants had indicated consent. Stratification was based primarily on English proficiency levels, using institutional records as well as data from the online bilingual (Arabic-English) background survey, completed in the first week of classes, which indicated the dominant medium of instruction in participants' high schools. Using a covariate of interest, English proficiency, within the constraints of the study context and with pre-registered, in-tact classes, is likely to have contributed to a representative cluster for each experimental condition. Shadish et al. (2002) explain that when pre-test differences exist, they influence the study results by virtue of their 'chance' nature, however pretests (in this case English proficiency) enhance the application of statistical techniques to improve statistical power. Further, and key to answering the research and outcome evaluation questions, "they can be used to examine whether treatment is equally effective at different levels of the pretest" (Shadish et al., 2002). Anecdotally, students at the MEHEI tend to register for the same courses as their cohort (year of matriculation) peers from the same major, and although this results in more homogeneity within class sections in terms of cohort and major, heterogeneity exists in areas such as English proficiency. Class schedule (time of day) of the in-tact class sections, as well as participant numbers in each class, were also factors that guided the assignment of condition. Classes were scheduled at three different times, two sections at 8am, two at 2pm, and one at 4pm, and class sizes ranged from 19 to 28 students.

**The study participants.** Participants' ages range from 18 to 24+ and averaged 20.2 years. Most ( $n = 46$ ) were in their fifth semester as an undergraduate while the smallest

number ( $n = 2$ ) were in their first, at the time of the study. Figure 8 below illustrates the participants' length of time as matriculated students at the MEHEI.



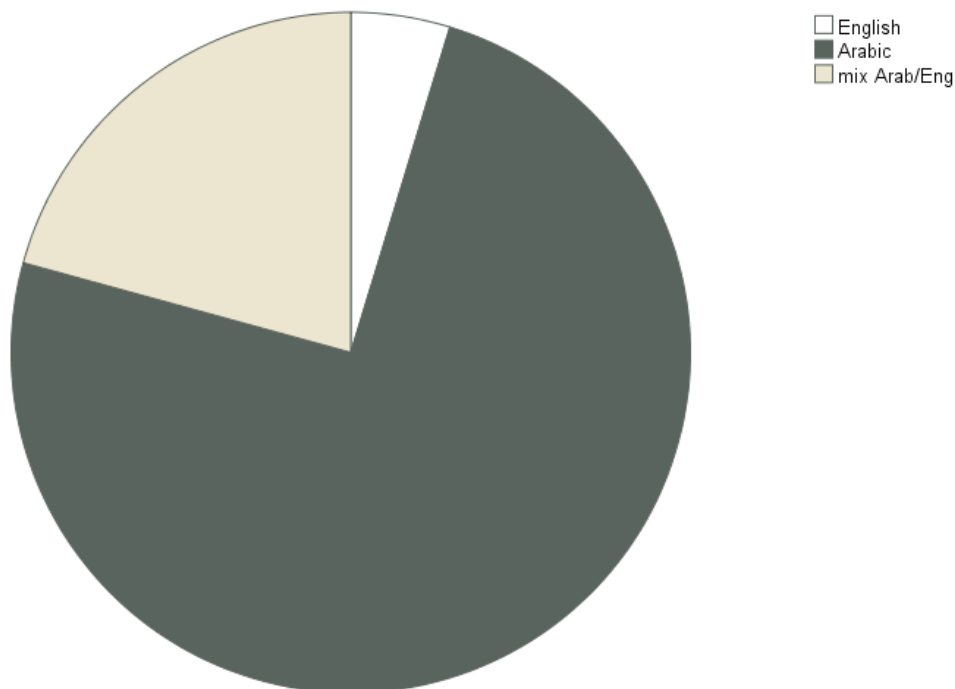
*Figure 8.* Participants' time as registered undergraduates (matriculated) at the MEHEI.

Three majors are represented in each of the three stratified groups, with over half of all participants in business ( $n = 57, 54\%$ ), a third in applied media ( $n = 36, 34\%$ ), and just over a tenth in engineering technology ( $n = 13, 12.3\%$ ).

According to institutional data and the background survey, only five participants (4.7%) studied at private school prior to joining the MEHEI, while a very large majority ( $n = 101, 95.3\%$ ) went to public, or government, K-12 schools. As for the dominant language of instruction in high school, three quarters of the participants ( $n = 79$ ) studied at Arabic-medium K-12 schools, while a fifth ( $n = 22$ ) went to schools where English and Arabic were mixed 50/50 and the

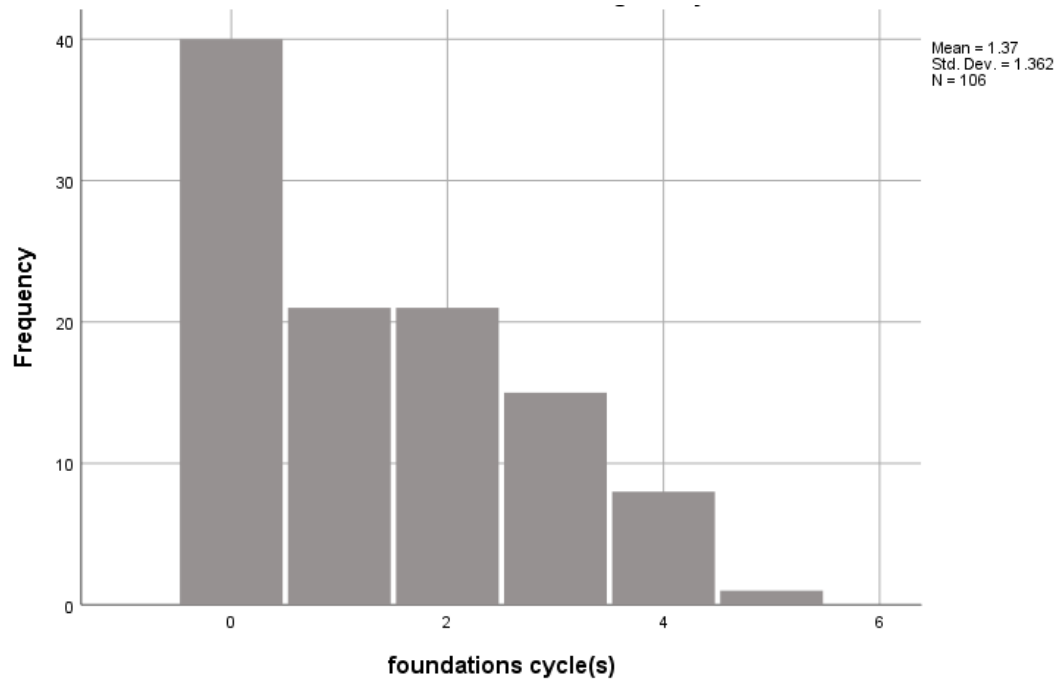


remainder ( $n = 5$ ) in English-medium K-12 environments, as illustrated in figure 9.



*Figure 9.* Participants' dominant language of instruction in high school.

As discussed in the previous chapter, applicants must meet the language proficiency requirement of IELTS 5.0 or CEPA 180 to matriculate. When they do not meet one of these benchmarks, students have the option of studying in the institution's academic study skills preparation program, also called foundations, in six-week cycles until they reach the required proficiency level. Data from the student background survey indicate that over a third of participants ( $n = 40$ , 38%) spent no time in foundations, meaning they entered the MEHEI as undergraduates. Institutional data of participants' proficiency scores when they applied to the MEHEI confirm these reports with a 70:30 split between those below the cut-off (CEPA score of 180) and those above. Figure 10 illustrates the proportion of participants who directly entered the MEHEI (i.e., zero cycles spent in foundations) and those who spent one to six cycles prior to matriculation.



*Figure 10:* Six-week cycles spent in the MEHEI preparation program.

**Indigenizing the intervention.** The intervention was implemented as part of an introductory research methods course in the general studies program. The MEHEI-based course objectives and assessments encompassed the basic steps and related concepts of scientific research and were determined by the institution. I designed and developed the example-based learning instructional and learning materials and activities to develop information problem-solving schema and skills steps one and two, the learning domain, and four problem scenarios, the exemplifying domain. The scenarios (see Appendix J) were related to four different challenges or barriers for Gulf citizens to gain employment in the knowledge economy, specifically in the private sector. The topic was selected for its relevance to students’ future goals and career aspirations. Also, Emiratis learn about regional aspirations to transition to a knowledge economy in high school social science courses, as well as in their Emirati studies courses in higher education (H. Alshamsi,

personal communication, October 2016). As discussed in the introductory chapter, the private sector in the UAE employs very few UAE citizens as evidenced in the extremely low levels of representation – less than 2% (Austin, Chapman, Farah, Wilson, & Ridge, 2014; Forstenlechner et al., 2014). For young Emiratis, aged 15-24, unemployment is high, at 23.1% (Barnett, Malcolm, & Toledo, 2015; Shaheen, 2011), which is an additional reason this topic is likely to be relevant to higher education students.

**The intervention, as implemented.** Each of the main features of the intervention was implemented in the study, despite a late start due to last-minute changes to the course structure at the MEHEI. Recall that the main features include a whole task approach, direct instruction of the two learning domain principles, namely Brand-Gruwel et al.'s (2009) first two steps of information problem-solving, activities to orient learners to the learning domain principles using worked examples (enacted and written), additional problem-solving practice activities with feedback, and problem-solving (as part of the research course).

The whole task approach enabled informal, formative evaluation of learners' background knowledge in the learning domain as well as the exemplifying domain, barriers for graduates to gain private-sector employment and enter the UAE knowledge economy. Through concept and comprehension checks and close monitoring of students' class work, I was able to identify knowledge gaps related to the exemplifying domain (e.g., the link between MEHEI graduate outcomes and the knowledge economy), which led to the development of additional materials and activities to build background knowledge. A strong knowledge base of the exemplifying domain is likely to reduce learners' extraneous cognitive load which has the potential to inhibit development of the

target learning domain (DeLeeuw & Mayer, 2008; Leppink, Paas, van Gog, van der Vleuten, & van Merriënboer, 2014), IPS schema and skills.

Direct instruction of the learning domain principles was implemented as planned and designed. For the first treatment, IPS step one principles were delivered via a ‘live’, teacher-led presentation to each class section, following a lesson plan. For treatment two, participants individually received direct instruction of IPS step two through a video, accessed via the learning management system. In addition, all students learned more global background information about the iterative processes of IPS steps one and two through class discussions about Brand-Gruwel and colleagues’ extensive skills decomposition research over the past two decades. Participants were surprised at the findings that experts spend up to five times longer than novices on the four components of step one to define the problem.

All participants completed the intervention treatment and tasks using the *test* feature of Blackboard, so that their responses could be recorded and linked to their student IDs. To test and trouble shoot the mode and method of the intervention protocol, all students completed a ‘trial run’ activity prior to this class in which they watched a video independently, and answered questions, with total control over the process. They also became familiar with opening documents (PDFs, Word) within the LMS, and practiced pausing their activities to take notes.

As part of the direct instruction portion of the treatment for IPS step one, participants viewed infographics of the four components of IPS step one, and received electronic PDF versions. The same icons from the direct instruction infographic were then used in the activities for both the control group participants, and the self-explanation

and explanation-help groups as a reminder of the four iterative components of IPS step one. Figure 11 below is a clip from the direct instruction materials (with text), and Figure 12 illustrates the infographic images with no text) displayed on the screen as part of the treatment materials.



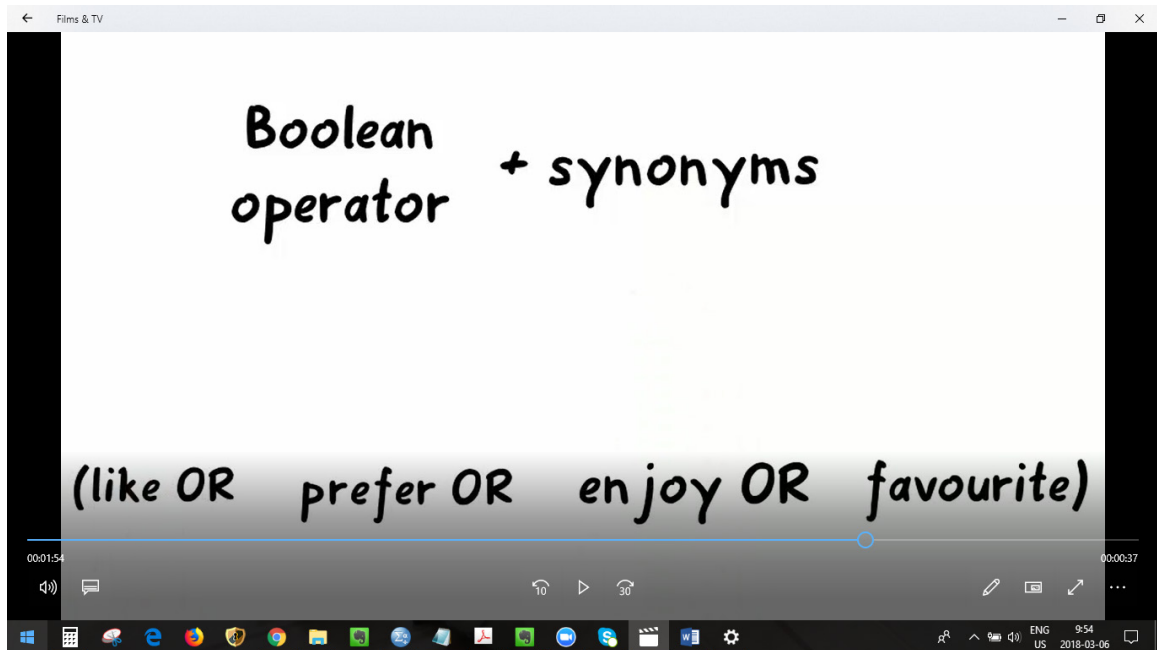
*Figure 11.* Clip of infographic images and text used during direct instruction of the principles, the four iterative components of IPS step one.



*Figure 12.* Clip of infographic images used during orienting and learning activities – without text - of the learning domain principles of IPS step one.

The intervention proceeded as designed for IPS step one, aside from the orienting activity for problem scenario two, discussed in detail in the process evaluation below. In all groups, students received feedback and explanations related to the principles via the learning management system, as well as part of whole class discussions at the end of sessions, and to launch follow up class sessions.

Direct instruction of IPS two, searching for information, was via video rather than ‘live’. All participants observed a brief (2m 30s) video, again delivered via Blackboard, the LMS, that illustrates the three main components, start with a plan (including list of information needed, from IPS step one), think of suitable synonyms, and create a search string using Boolean operators. Students controlled the activity individually and independently, and took notes. Figure 13, below is an illustration of the video.



*Figure 13.* Screen capture of the video used for direct instruction of IPS step two, searching for information.

As with the treatment for IPS one, participants received either enacted or written worked examples (self-explanation and explanation-help groups) or learning activities only (control group) using the same problem scenarios (see Appendix J). Similarly, all participants received feedback during the treatment, as well as at the end of the session, and the beginning of the following class session. More detailed analysis of the process of the intervention is below.

### **Process evaluation**

Overall, the intervention was implemented as designed and with adequate, but not high fidelity. Data from the reflective instructional journal, annotated checklist, and artefacts from the treatment indicate that the three criteria for high fidelity, adherence, dose, and differentiation, were met except for one portion of one of the two treatments. Specifically, in the second of four treatment activities for IPS step one, both the self-explanation and explanation-help groups received the same orientation activity, designed for the EHG. This compromised fidelity as it pertains primarily to differentiation.

**Adherence.** The reflective journal, as well as MEHEI records from Blackboard and other artefacts from the learning activities indicate that, broadly speaking, all learners experienced phases one and two of Renkl's (2014) example-based learning model. That is, the first two stages of Renkl's (2014) scaffolded, socio-constructivist support model, principle encoding and relying on analogs, were implemented as designed, described in the previous chapter. As part of the principle encoding phase - direct instruction treatment sessions - participants received either live (IPS one) or video-based (IPS two) explicit instruction and took notes. In each case, students responded to the question, *What questions do you have?* at the end of the treatment session, and were encouraged to refer to their notes and consider the application of the material (principles from IPS one or two) in relation to their coursework or to their other college courses. For phase two of Renkl's (2014) model, relying on analogs, participants used the enacted and written worked examples to complete the orienting activities in which they were prompted to recognize (explanation-help) or explain (self-explanation) the IPS principles therein. While the control group did not experience the worked examples (neither enacted nor

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written) or orienting activities, they did exploit the same four problem scenarios to engage in comprehension and concept check activities designed to elicit recognition of the same schema and skills. For each activity, participants received explanatory feedback. These conditions reflect high fidelity of adherence to the instructional approach, Renkl's (2014) example-based learning, as designed.

**Dose.** High fidelity requires participants to attend each intervention session to receive full dose of the treatment, as designed. Efforts to ensure high fidelity included closely monitoring attendance and ensuring that all students who missed the originally scheduled sessions had an opportunity to complete all treatments subsequently. All participants attended almost every treatment session, and between one and four students were absent during about four to six sessions overall, according to institutional attendance records and journal entries. Because intervention materials were video-based and individually controlled by participants, those who had been absent during designated intervention class sessions were able to complete the activities in the common area of the MEHEI instructors' office. Just as with the in-class treatment, learners who had been absent worked independently in the instructors' office using their own devices (i.e., laptop, tablet, etc.), headphones and note-taking resources I was nearby to assist with any technical or learning questions. These conditions represent high fidelity of dose.

**Differentiation.** Data from learning materials, students' completed work, and the reflection journal indicate clear and distinct differentiation between treatment and control groups overall, with one exception. The self-explanation group (SEG) did not receive the complete treatment as originally designed. The two SEG classes mistakenly received example-help prompts – which do not elicit the orienting activity of self-explanation - for



the second of their four treatment activities for the first treatment of the study, IPS one. That is, SEG participants received one instead of two SEG treatment sessions, and received the same treatment as the explanation-help participants, instead. While receiving the enacted example related to problem scenario two, SEG participants viewed the same video and activities as the EHG. Aside from this error, each group received the intended treatment as designed, following Renkl's (2014) model for the first two phases of example-based learning, including the orienting activities, as well as the learning domain schema and skills from Brand-Gruwel et al.'s (2009) model. This deviation from the design may have compromised fidelity as it pertains to differences between the two treatment groups vis-à-vis the orienting activity, but not in relation to the control group or to the principles of EBL in general. Due to this mistake with the self-explanation group during the first IPS treatment high fidelity through differentiation was mostly, but not fully, achieved. This represents adequate-to-high fidelity overall.

Process evaluation informs the research and instructional design components of implementation, however the experiences and performance of the participants – students and instructors – are equally important. The next section, Findings, addresses not only an outcome evaluation of the intervention, but also participants' experience of the treatments, including its impact on information problem-solving skills development, performance, and behaviour, as well as on mental effort and evaluation of the training. Participants' experiences are examined in depth in the fourth and final research question.

### **Findings**

The central purpose of this study was to implement and evaluate Renkl's (2014) example-based learning (EBL) instructional framework with Arabian Gulf higher

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education learners and specifically, to optimize participants' cognitive load and facilitate development of the initial skills and schema of the first two steps of Brand-Gruwel et al.'s (2009) information problem-solving (IPS) model. In particular, the intervention was designed to investigate two example-based learning orienting activities, self-explanation and explanation-help, and contrast the treatments with a standard instructional approach (no treatment). Measuring changes and differences among participants in their information problem-solving skills and schema, then, played a key role in the design and implementation of the study. As such, the dependent variable, IPS skills, is particularly important.

The IPS skills measurement tool (see Appendix H), referred to herein as the IPS skills test, and its rubric (Appendix I) were adapted, or indigenized, from the work by Brand-Gruwel et al. (2009) and Frèrejean et al. (2016) to meet the particular needs of the learning and instructional context. Table 17 below outlines the three IPS skills test items, prompts, and the related treatments. Items one and three of the IPS skills test are of greatest relevance to the study purpose and intervention treatments, and are connected to Brand-Gruwel et al.'s (2009) information problem-solving step one (defining the information problem) and step two (searching for information) respectively. Item two on the IPS skills test (describe the prompt in your own words) is related broadly to information problem solving step one – defining the problem - and was part of the original instrument, however the skill of paraphrasing and re-stating the information problem was not directly addressed in instruction.

Table 17

*IPS Skills Test Items and Related Treatment*

Item	Prompt	Related treatment (IPS step)
1	How would you <u>start</u> this assignment? What is your <u>first step</u> to do this work, and <u>why</u> ?	Treatment one: iteratively engage in four activities to understand and define the task (IPS 1)
2	What do you have to do, exactly? Explain the assignment <u>in your own</u> <u>words</u>	Not explicitly addressed in the treatment: paraphrase to define the task (IPS 1)
3	What would you type into Google?	Treatment two: use search terms, Boolean operators, and parentheses to systematically search (IPS 2)

As described earlier, a single instrument or data set is insufficient to understand the myriad factors at play in this complex setting (Creswell & Plano Clark, 2011). For this reason, multiple measures and data sources, described below, enabled data gathering to frame the responses to the four research questions. Table 18 outlines the research questions and the measurement tools and frequency, and the results of analysis are below.

Table 18

*Research Questions and Measurements*

Research question	Measurement
<i>RQ1 What changes occur in participants' IPS skills as a result of receiving worked examples?</i>	4 measures using <i>Information Problem-solving (IPS) Skills Test</i> : pre-test, post-test 1, post-test 2, and retention
<i>RQ2 Is there a difference in achievement of IPS skills among the participants who receive one of the two variations of the treatment condition (example-based learning instruction with self-explanation or explanation-help scaffolds) and the control group, who received no treatment?)</i>	as above
<i>RQ3 Is there a difference in IPS behaviour as a result of receiving worked examples?</i>	2 measures using <i>Information Problem-solving behaviour survey</i> : pre-test, retention
<i>RQ4 What results emerge from comparing the exploratory qualitative data about participants' evaluation of learning and researcher-instructor qualitative data about implementing the intervention with outcome quantitative data measured on the IPS skill instrument?</i>	2 measures of <i>Student evaluation of training</i> : post-test 1, post-test 2 2 measures of <i>Mental effort survey</i> : post-test 1, post-test 2 <i>Reflective journal</i> : throughout study Annotated instructional and learning artefacts: throughout study

For the purposes of this analysis, my sample size is 106. Overall, each treatment group was similar in terms of range of language proficiency at the time of application to the MEHEI. This proficiency data, for some, may have been four years prior to the study. Table 19, outlines the mean proficiency scores for each group, as well as the type of high school they attended, and the academic stream.

Table 19

*Participant Group English Proficiency, High School Type, and High School Stream*

	Treatment group		
	self-explanation ( <i>n</i> = 44)	explanation-help ( <i>n</i> = 45)	control ( <i>n</i> = 17)
English level <i>M</i> ( <i>SD</i> )	172.2 (14.01)	169.6 (11.9)	168.9 (8.1)
High school type <i>n</i>			
private	2	1	2
public	42	44	15
High school stream <i>n</i> (% of group)			
arts	32 (72%)	26 (59%)	15 (88%)
science	12 (28%)	18 (41%)	2 (12%)

*Note.* English level is the mean of each group's CEPA exam score at the time of application to the MEHEI. Minimum CEPA score for matriculation is 180, or IELTS 5.0.

**Research Question 1**

The first research question examines the changes in information problem-solving skills for the two sets of treatment participants, self-explanation group (SEG, *n* = 44, 41.5%) and explanation-help group (EHG, *n* = 45, 42.5%). Specifically, it asks, *What changes occur in participants' IPS skills as a result of receiving worked examples?*

Mean scores on the IPS skills test (Appendix H) and a paired samples t-test, by item (i.e., items 1, 2, and 3, and by total score, the sum of scores, out of 10), were calculated at pre-test and retention. Beginning with total scores (i.e., sum of items 1, 2, and 3, out of a possible score of 10), results show that, on average, IPS skills performance of participants who received treatment was higher at retention ( $M = 4.96$ ,  $SD = 1.60$ ) than at pre-test ( $M = 4.59$ ,  $SD = 1.71$ ) and a t-test confirmed this to be a significant difference,  $t(75) = -1.804$ ,  $p = .075$ . This suggests that overall, information problem-solving skills for

participants who received the worked examples (i.e., both self-explanation and explanation-help groups) increased from pre-test to post-test levels. Table 20 summarizes the treatment group IPS scores.

Table 20

*Treatment Group IPS Performance: Pre-test versus Retention*

	Item 1 Understand problem (/4)	Item 2 Re-state problem (/2)	Item 3 Create search string (/4)	Total IPS Score (/10)
Pre-test	$M = 1.45$ ( $SD = 0.971$ ), $n = 82$	$M = 1.01$ ( $SD = 0.728$ ), $n = 86$	$M = 1.94$ ( $SD = 1.148$ ), $n = 82$	$M = 4.59$ ( $SD = 1.714$ ), $n = 76$
Retention	$M = 1.79$ ( $SD = 1.039$ ) $n = 82$	$M = 0.91$ ( $SD = 0.500$ ), $n = 86$	$M = 2.15$ ( $SD = 0.891$ ), $n = 82$	$M = 4.96$ ( $SD = 1.595$ ), $n = 76$
$t$ ( $df$ )	$t(81) = -2.624$	$t(85) = 1.195$	$t(81) = -1.546$	$t(75) = -1.804$
$p$ ( $\alpha = .05$ )	.010	.235	.126	.075

**Target IPS skills.** Next, to investigate the changes in performance specifically of information problem-solving skills one and two, defining the information problem and searching for information (test items 1 and 3 respectively), results from mean scores and paired samples  $t$ -test analyses also indicate performance gains between pre-test and retention periods. For IPS skill one, treatment group participants showed significant improvement,  $t(81) = -2.624$ ,  $p = .01$  from pre-test ( $M = 1.45$ ,  $SD = .97$ ) to retention ( $M = 1.79$ ,  $SD = 1.04$ ). Treatment groups also improved their performance in IPS skill two from pre-test ( $M = 1.94$ ,  $SD = 1.15$ ) to retention ( $M = 2.15$ ,  $SD = .89$ ), however the difference was not statistically significant,  $t(81) = -1.546$ ,  $p = .126$ . Note that the treatment participants' mean starting point at pre-test for skill two, information search,

was higher than for both other items. This may explain why the gain was not significant. In other words, with a higher starting point for this skill, there may have been less ‘room’ for significant improvement in the short time frame. Finally, findings indicate that performance on item two of the IPS skills test was different for the treatment groups. As noted earlier, this item elicited re-statement of the information problem or task in one’s own words, a skill not explicitly addressed in the treatments or in instruction during the semester. There was no significant change in performance from pre-test ( $M = 1.01, SD = .73$ ) to retention ( $M = .91, SD = .50$ ),  $t(85) = 1.195, p = .235$ .

### **Research Question 2**

Research question two widens the analysis lens by including the control (no treatment) group, and looks more closely at information problem solving skills performance across all three groups, self-explanation, explanation-help, and control. It asks, *Is there a difference in achievement of IPS skills among the participants who receive one of the two variations of the treatment condition (example-based learning instruction with self-explanation or explanation-help scaffolds) and the control group, who received no treatment?*

**Focus one: Treatment versus no treatment (control).** Descriptive statistics of mean pre-test and retention information problem-solving performance on each of the three items of the IPS skills measure by group (treatment, combined and control) are illustrated in Table 21. The results indicate that, for both the control and the treatment groups, mean scores increased from pre-test to retention for items one (describe first steps) and three (search string) but decreased for item two (re-state the problem) on the measure. Re-stating the information problem was not explicitly targeted as part of the

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treatment. Instead, it was included within the principles and processes of IPS step one, defining the information problem. The descriptive statistics also indicate that mean scores on each item were lower for the control group at pre-test, so further analysis was needed to take this into consideration. A one-way analysis of co-variance (ANCOVA) was conducted to compare the retention performance levels of the control and treatment groups with pre-test performance as the co-variate of interest. There was no significant difference between the control and treatment groups in performance of IPS skills one ( $F(1, 94) = .463, p = .498$ ) and two ( $F(1, 91) = .120, p = .730$ ) when controlling for pre-test performance.



Table 21

*IPS Test Scores at Pre-test and Retention, Treatment (aggregated) versus Control Group*

	Item 1 Understand problem (/4)				Item 2 Re-state problem (/2)				Item 3 Create search string (/4)			
	Pre-test		Retention		Pre-test		Retention		Pre-test		Retention	
	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>
Treatment	85	1.44 (0.97)	86	1.76 (1.04)	88	1.00 (0.73)	87	0.91 (0.50)	82	1.94 (1.15)	88	2.10 (0.90)
Control	16	1.00 (0.82)	16	1.50 (0.73)	17	0.71 (0.59)	16	0.63 (0.62)	12	1.75 (1.22)	17	1.88 (1.11)

**Focus two: Self-explanation versus explanation-help versus no treatment**

**(control).** To investigate differences among all three treatment groups in IPS skills scores, descriptive statistics of mean pre-test and retention IPS skills scores by treatment group were examined. Results are provided below, in Table 22. Findings indicate that, for each IPS skills test item, the control groups mean scores were the lowest of the three groups at pre-test and remained so at retention. As with the treatment versus no-treatment analysis earlier, mean scores for each group increased from pre-test to retention for items one and three, but not for item two. In fact, mean scores for each group decreased.

Table 22

Self-explanation, Explanation-help, and Control Groups' IPS Scores at Pre-test and Retention

	Item 1 What do you do first?				Item 2 What is the task?				Item 3 What do you put in Google?			
	Pre-test		Retention		Pre-test		Retention		Pre-test		Retention	
	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>
Self-explanation	43	1.33 (0.84)	43	1.53 (0.98)	38	1.00 (0.62)	42	0.93 (0.51)	41	2.00 (1.16)	43	2.19 (0.82)
Explanation-help	42	1.55 (1.09)	43	1.98 (1.06)	40	0.95 (0.64)	45	0.89 (0.49)	41	1.88 (1.14)	45	2.02 (0.97)
Control	16	1.00 (0.82)	16	1.50 (0.73)	14	0.64 (0.63)	16	0.63 (0.62)	12	1.75 (1.22)	17	1.88 (1.11)

A repeated measures analysis of variance (ANOVA) was conducted to compare the effect of the treatment, example-based learning, on information problem solving skills one (define the problem) and two (search) in the self-explanation, explanation-help, and control (no treatment) conditions. The ANOVA compared differences among the groups' scores at pre-test and retention. For IPS skill one, there was a significant between-subjects effect of the treatment at the  $p < .016$  level,  $F(2, 94) = .413$ ,  $MSE = .280$ . Figure 14, below, illustrates the estimated marginal means of this analysis. These results suggest that, among the three treatment groups, there is a treatment effect.

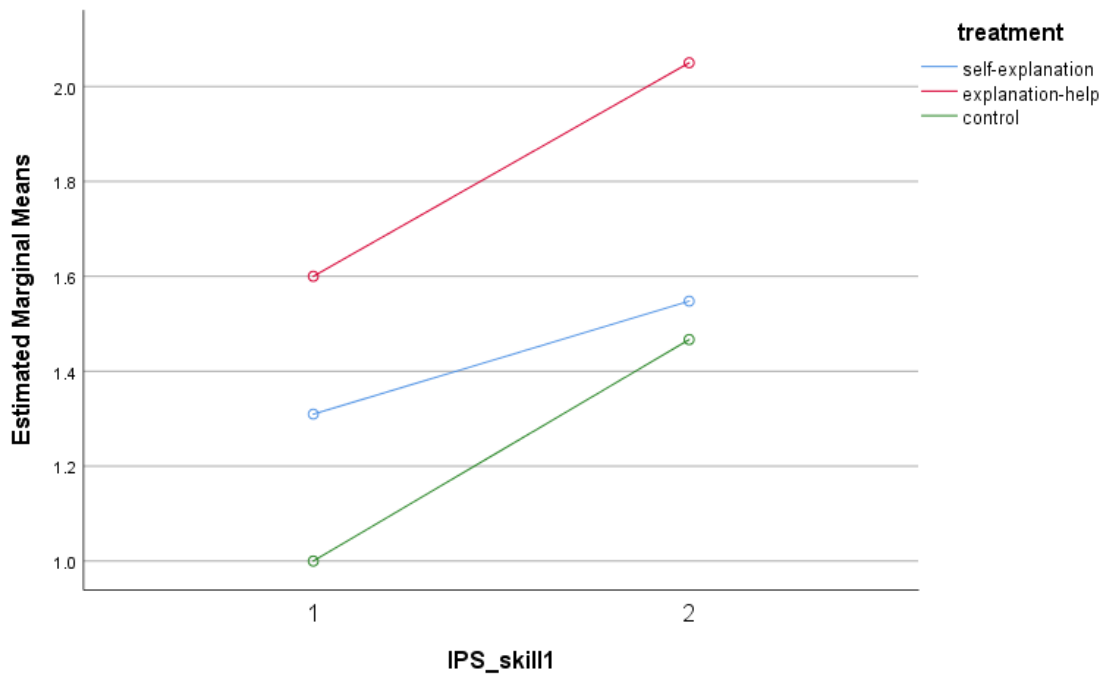


Figure 14. Estimated marginal means, IPS skills test, item 1 (define the problem), pre-test (time 1) to retention (time 2) for self-explanation, explanation-help, and control (no treatment) groups.

For IPS skill two, results from the ANOVA found no significant between-subjects effect of the treatment ( $p = .695$ ,  $F(2, 91) = .413$ ,  $MSE = .365$ ). Overall, these results suggest a treatment effect for information problem solving skill one, define the problem, but not for

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skill two, searching for information. Given that IPS skill one was the focus of treatment one, and was reinforced iteratively throughout the course, this result is not surprising.

A split plot within-subjects analysis of co-variance (ANCOVA) was conducted to examine the differences among the treatment groups' mean total scores on all four measures, pre-test, post-test 1, post-test 2, and retention. Two between-subjects variables were considered, treatment and English proficiency. Results indicate a significant main effect for treatment,  $F(2, 68) = 10.39, MSE = 44.38, p < .001$ . Figure 15, below, is a line chart of estimated marginal means for the independent variable, treatment. The same analysis was conducted to test for differences based on English language proficiency, with the matriculation cut-off, CEPA 180 (roughly the equivalent of an IELTS 5.0). As with the treatment results, the split plot ANOVA findings suggest a significant main effect for English proficiency,  $F(1, 69) = 10.22, MSE = 48.90, p < .002$ . Figure 16 provides the results, also in a line chart. Analysis of variance based on high school type (public or private) did not reveal a significant main effect ( $F(1, 69) = .173, MSE = .948, p < .679$ ).

Together, these findings suggest a main effect for both treatment and English proficiency, but not for high school type.

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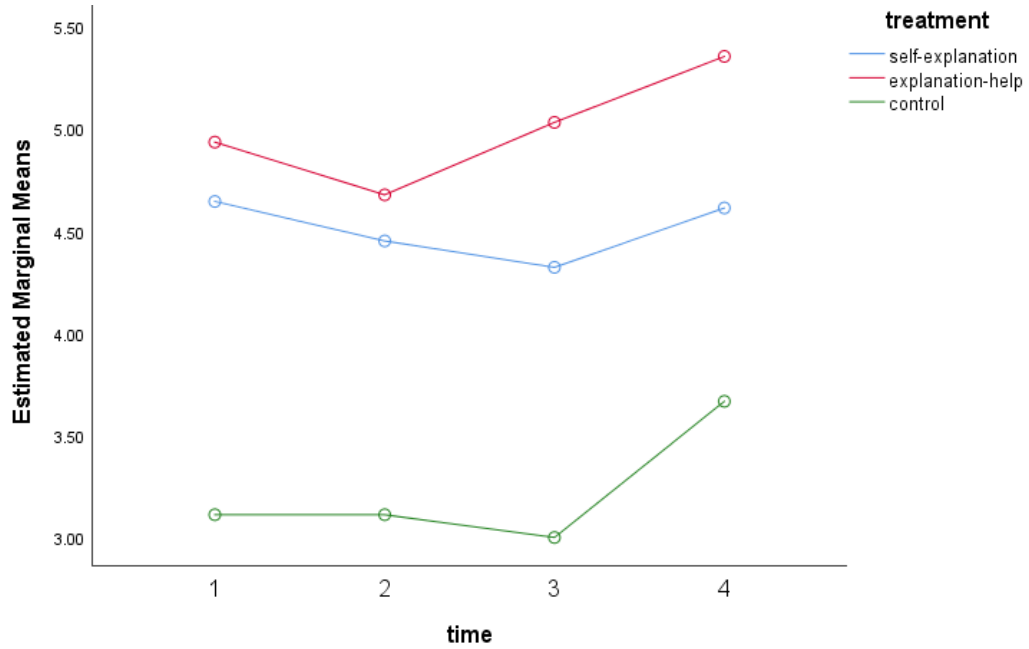


Figure 15. IPS skills test, item one, estimated marginal means among self-explanation, explanation-help, and control groups.

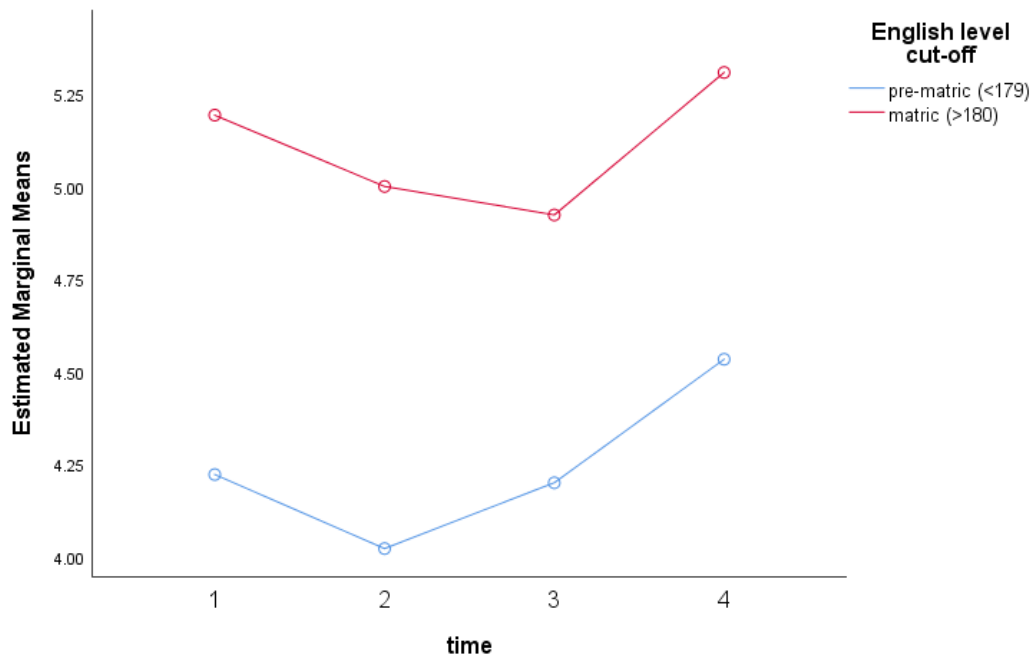


Figure 16. IPS skills test, item one, estimated marginal means among self-explanation, explanation-help, and control groups.

**Focus three: Self-explanation versus explanation-help.** Finally, to examine differences between the two treatment groups who received different orienting activities, namely self-explanation and explanation help, descriptive statistics of mean scores on all four IPS skills tests were calculated. Results indicate that, beginning at pre-test performance levels, the explanation-help group outperformed the self-explanation group, as indicated in Table 23, below. Given the unequal starting points, these results cannot be interpreted as an effect of the type of orienting treatment.

Table 23

*IPS Skills Performance on all Measures: Self-explanation versus Explanation-help*

	Self-explanation		Explanation-help	
	<i>n</i>	<i>M (/10) (SD)</i>	<i>n</i>	<i>M (/10) (SD)</i>
Pre-test	40	4.38 (1.92)	38	4.68 (1.61)
Post-test 1	38	4.12 (1.61)	39	4.49 (1.39)
Post-test 2	38	4.37 (1.44)	41	4.92 (1.78)
Retention	42	4.71 (1.45)	43	4.91 (1.74)

An independent samples *t*-test was conducted to compare the performance on individual IPS skills test items of the explanation-help and self-explanation participants on all four IPS skills tests, namely baseline (pre-test), post-tests one and two, and retention. For item one, which targeted information problem-solving skill one - defining the problem, there was a significant difference ( $p = .053$ ) immediately following treatment one (focused on this particular skill). The explanation-help group,  $M = 1.88$  ( $SD = .68$ ), outperformed the self-explanation group  $M = 1.35$  ( $SD = .66$ ),  $t(79) = -3.545$ . Similarly, a significant difference,  $p = 001$ , was found in post-test two, as the

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explanation-help group,  $M = 2.62$  ( $SD = 1.08$ ) outperformed the self-explanation group,  $M = 2.03$  ( $SD = .79$ ),  $t(78) = -2.777$ ). No significant differences were found at pre-test ( $p = .182$ ) or retention ( $p = .542$ ). Interestingly, performance was reversed with item three of the IPS skills test on each measure, with the self-explanation group outperforming the explanation-help group on each measure. There was no significant difference, however. These findings are summarized in Table 24, below.

Table 24

*Self-explanation and Explanation-help Group Scores, IPS Skills Test Items 1 and 3*

	Self-explanation		Explanation-help		$t$ ( $df$ )	$p$
	$n$	$M$ ( $/4$ ) ( $SD$ )	$n$	$M$ ( $/4$ ) ( $SD$ )		
Item 1 – first step						
Pre-test	43	1.33 (.84)	42	1.55 (1.09)	-1.057 (83)	.182
Post-test 1	40	1.35 (.66)	41	1.88 (0.68)	-3.545 (79)	.053
Post-test 2	38	2.03 (.79)	42	2.62 (1.08)	-2.777 (78)	.000
Retention	43	1.53 (.98)	43	1.98 (1.06)	-2.005 (84)	.542
Item 3 – search						
Pre-test	41	2.00 (1.16)	41	1.88 (1.14)	.479 (80)	.864
Post-test 1	40	1.78 (.92)	40	1.65 (.92)	.607 (78)	.854
Post-test 2	38	1.50 (.83)	43	1.42 (1.01)	.394 (79)	.457
Retention	43	2.19 (.82)	45	2.02 (.97)	.855 (86)	.619

### Research Question 3

The next research question shifts attention away from performance, and considers participants' information problem-solving behaviour with the question, *Is there a*



*difference in IPS behaviour as a result of receiving worked examples?* Two data sources were analyzed to understand treatment group participants' behaviour as a result of receiving worked examples. Qualitative data from the reflective journal as well as from descriptive statistics of respondent self-ratings on the IPS behaviour survey indicate few changes in information problem-solving behaviour between the beginning (pre-test) and end (retention) of the course, as well as anomalous or contradictory results.

Reflective journal data indicate that participants persisted in their tendency to collaborate with and rely on other students during class sessions for their learning. Data from week one until the final weeks of the course suggest that students resisted working on their own and complained about not being able to sit beside or work with their friends. One excerpt from the journal from week six of the course reads, "It's a very frustrating experience to go through note-taking; if I do not monitor very closely, many just copy from each other". In addition, participants continued to seek further explanation of myriad types of information from their peers in Arabic. For example, in the class session following treatment two in which Boolean operators featured prominently, journal entries indicate that students in each of the five sections asked, in Arabic, what Boolean meant as they faced a search task related to their next research step. (In whole-class discussions with each class section, fewer than three students knew what the term Boolean meant - despite over one third ( $n = 35$ ) of respondents indicating in the pre-test IPS behaviour survey that they use Boolean operators in their studies.) Another student complained about her low grade for work that did not meet basic requirements and stated that she had done what her friend told her to do. This suggests that, instead of re-reading the task or

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asking for clarification, a fundamental element of IPS step one, she had sought the help of a peer in class.

Participants' self-ratings of the frequency of seeking assistance from others are generally consistent with these observations. IPS behaviour survey data indicate that treatment participants' self-ratings on the item, *When I do not understand the task (assignment), I check with another student*, on a scale from 1 (*never*) to 5 (*always*), actually increased from a pre-test mean of 3.34 ( $SD = 1.13$ ) to 3.47 ( $SD = 1.12$ ) at retention. Although the increase is not significant ( $p < .593$ ), it is notable in that both pre- and retention ratings are well above the 50% mark on the Likert continuum, i.e., likely indicating more than 50% of the time. In addition, participant responses to another item, *When I get an assignment for my college course, I usually follow (or copy) what my friends do*, almost doubled from pretest levels at 7% of participant agreement to 11% at retention. Overall, these findings indicate the tendency to collaborate with and seek assistance from peers.

Data from the IPS behaviour survey and instructor's reflective journal that related more directly to the schema and skills targeted in the treatment were also analyzed. Findings were contradictory. IPS behaviour survey data gathered in week one indicate that almost 90% ( $n = 79$ ) of treatment participants check (re-read) the assignment to see what they still need. Conversely, data from the reflective journal from the class session immediately following completion of the survey indicate that I had to circulate, and monitor constantly during the pre-test measure for IPS skills. Instructions were in Arabic and English, but as I indicated in the journal, "quite a few did not read beyond the red text" (sample essay prompt) and started to answer the prompt itself, which was incorrect.

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That is, rather than respond to the IPS skills test instructions to explain, for example, what their first step would be if they received the essay prompt, several respondents simply began to address the essay prompt itself. Retention survey data for the same item indicate a 2% increase to 91% ( $n = 81$ ), which suggests that the treatment, along with my consistent instructions and modeling to follow the instructions may be reflected in modest increases in closer reading.

### **Research Question 4**

Finally, research question four explores the aspect of experience of the intervention, both by the participants and by me as both researcher and instructor. It asks, *What results emerge from comparing the exploratory qualitative data about participants' evaluation of learning and researcher-instructor qualitative data about implementing the intervention with outcome quantitative data measured on the IPS skill instrument?*

Analysis of multiple data sources was conducted to identify patterns and themes related to the intervention. Data sources included the reflective journal and annotated adherence checklist, participants' notes and responses to learning activities, qualitative and quantitative data from all participants' evaluation of learning, and mental effort ratings of treatment group participants following interventions one and two. Overall and not surprisingly, findings portray a complex picture.

**Participant experience.** Overall, data from student evaluation of the training and their own mental effort, along with qualitative data from observations and artefacts of student work indicate that most participants were positive about the treatment, and that less proficient learners found the training required more mental effort (cognitive load). In addition, the design of the instructional intervention, especially its initial stage, seemed to

be effectively matched with students' preferred learning approach. Observation data from the reflective journal indicate that students sat in pairs or small groups, especially at the beginning of the course, and took very few notes. In each class, between five to ten students took no notes until strongly encouraged to do so. In the early stages of the course, very few students asked questions. These findings suggest a preference for collaboration and a reluctance to engage in active learning, including comprehension checks.

**Evaluation of the training.** Treatment group participants evaluated the training experience immediately following intervention treatment one (information problem-solving skill one, defining the information problem) and two (searching for information). Control group participants did not complete evaluations of their experiences with the regular approach they received. Descriptive statistics of mean scores indicate that perceptions were overwhelmingly positive about the orienting task learning experiences, i.e., self-explanation and explanation-help treatments. Results show that 95% ( $n = 81$ ,  $SD = .22$ ) of treatment group participants agreed with the statement, *The training activities helped me to understand how to begin a research project.* after treatment one, and this was even greater at 98.7% ( $n = 81$ ,  $SD = .25$ ) following the second treatment. A t-test found that the difference is not significant ( $t(80) = -1.136$ ,  $p = .259$ ).

To compare perceptions between self-explanation and explanation-help group members, descriptive statistics of mean scores were calculated on the item above related to perceived benefits of the treatment for starting one's research. Results indicate that, overall, the explanation-help group felt more positive about the treatment than the self-explanation following both treatments. As Table 25 illustrates, the EHG indicated 5% and

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8% more agreement than the SEG that the first and second treatments respectively were beneficial for starting their research.

Table 25

*Mean Ratings of Agreement of Training (Treatment) Benefits for Starting Research*

Treatment	IPS step one training % agreement		IPS step two training % agreement	
	<i>n</i>	<i>M</i>	<i>n</i>	<i>M</i>
Self-explanation	43	90.9	39	89.7
Explanation-help	45	95.6	43	97.7

Qualitative data (in their original form) from treatment group participants are consistent with the overall positive indicators. Table 26, below, provides representative comments.

Table 26

*Treatment Group Participant Evaluation Comments*

Self-explanation participants	Explanation-help participants
<i>very helpful and new and very useful because it will me a lot during my research (Participant 144)</i>	<i>it helps a lot to know what we have to do in the project and give us a lot of knowledge (Participant 208)</i>
<i>In the past I think that the research is too difficult, but now when I learn how to do it with this training, its be easier for me (Participant 137)</i>	<i>its a good training every class i learn new thing (Participant 207)</i>
<i>it helped me a lot in understanding the information and in remembering them, i think it is a useful method (Participant 110)</i>	<i>Interesting and I learned new things for searching that I didn't know it before (Participant 202)</i>

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The qualitative data also suggest that some participants were building awareness that the treatment represented more than a class activity and was a strategy that could be transferred to other contexts. According to one respondent from the explanation-help group, “i am sad because i didn't took this subject firstly, it can help me a lot in other general subject,really i know my self i will learn a lot of things this semester” (Participant 244). Further, some participants commented about the nature of the orienting activities. For instance, Respondent 103 of the self-explanation group stated that “its different that the usual, more declaration of the idea”. This perception may also reflect emerging meta-awareness, possibly as a result of the additional step of articulating the principles in the worked examples that self-explanation group participants took. Similarly, an explanation-help group participant also noted the emphasis of the activities on specific content (i.e., principles) in her statement, “I liked this kind of learning because it let the student more focusing” (Participant 234).

A small number of students communicated that the treatment was simply “different” (Respondent 103, self-explanation group), and perhaps more challenging as the following three comments indicate:

- “long but good” (Respondent 107, SEG)
- “it was useful but tiring at the same time” (Respondent 111, SEG)
- “its good , but it takes a lot of time sometimes” (Respondent 123, SEG)

Importantly, each of these contributions is from the self-explanation group and followed the second intervention treatment, related to information search strategies. These themes are consistent with my observations as I circulated and monitored during the treatment activities. Journal entries indicate that most students in each class session said that the

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search strategy (IPS step two) treatment was very tiring, and many sighed heavily once they completed it. Again, the journal data suggest that students found the independent learning aspect of the activities challenging as they appeared uncomfortable sitting on their own and controlling their own devices. Journal data also indicate that, in each class, a small number (maximum  $n = 5$ ) voiced resistance to the independent learning mode for each treatment and wanted to remain seated next to their friends and share devices. In addition, during the video-based independent work, data from the journal indicate that students' expressions appeared to be very serious which contributed to the perception that the participants were not enjoying the tasks. The contradicting perceptions across the different data sources may be better understood with analysis of mental effort data.

**Mental effort.** Using a scale from zero (*very, very low*) to nine (*very, very high*), all participants – treatment and control - rated the mental effort they had exerted during the four learning activities (problem scenarios associated with barriers to employment in the UAE private sector) twice: first, for defining the information problem (IPS one, an ill-defined problem), and second, for formulating a search strategy (IPS two, a well-defined problem). Analysis of mean scores suggest that, on average, and not controlling for differences within each group, participants exerted more mental effort or bore greater cognitive load for IPS skill two, information search strategy. A paired samples t-test was conducted to compare reported mental effort between the two IPS skills, and findings suggest that there was a significant difference ( $p = .001$ ) between participants' mental effort during the second information problem-solving skill, formulating a search strategy ( $M = 5.47, SD = 1.93$ ) and the first IPS skill, defining the information problem ( $M = 4.77, SD = 1.82$ ),  $t(96) = -3.43$ ). Results from a second paired samples t-test with participants



grouped by treatment indicate a similar pattern with participants rating their mental effort higher for the second IPS skill associated with information search. The differences in mean scores for each treatment were significant for the two treatment groups, but not for the control group, with SEG at  $p = .004$  and EHG at  $p = .096$ , as indicated in Table 27 below. Overall, the explanation-help group rated their mental effort the highest of all three groups for both treatments, which is notable given the qualitative data from only the self-explanation characterizing the second treatment especially as lengthy and tiring.

Table 27

*Mental Effort by Treatment Focus (IPS Step 1 versus IPS Step 2)*

Group	Treatment focus	Mental effort			$t$	$df$	$p$
		$M$ ( $/9$ )	$N$	$SD$			
Self-explanation	1 - define problem	4.37	38	1.715	-3.043	37	.004
	2 - search strategy	5.26	38	1.826			
Explanation-help	1 - define problem	5.05	43	1.988	-1.703	42	.096
	2 - search strategy	5.63	43	2.138			
Control	1 - define problem	5.00	16	1.506	-1.187	15	.254
	2 - search strategy	5.56	16	1.590			

**English proficiency and mental effort.** An independent samples  $t$ -test was conducted to compare mental effort ratings grouped by participants' proficiency levels, based on the English cut-off score for matriculation at the MEHEI, a CEPA score of 180 (as described earlier). For IPS 1 (defining the problem, an ill-structured problem), there was a significant difference ( $t(50.895) = 3.906, p = 0.001$ ) in the mental effort ratings by less proficient ( $n = 74, M = 5.19, SD = 1.64$ ) and the more proficient ( $n = 31, M = 3.77, SD = 1.84$ ) participants. These data suggest that, on average and not controlling for differences within each group, the schema building activity associated with defining an

information problem may be more challenging for students with limited or low English proficiency. That is, as English proficiency rises, mental effort to engage in IPS one, defining the information problem, requires less mental effort, or cognitive load.

**High versus low English proficiency and performance.** A *t*-test analysis was conducted to compare mean scores of each item on the IPS skills test, and overall performance between participants with low and high English proficiency. Once again, the matriculation cut-off score of 180 on the national proficiency exam, CEPA, was used to determine high and low proficiency. Results indicate that high proficiency participants' performance ( $M = 77.01$ ,  $SD = 23.32$ ) on IPS skills test item 2 was higher than that of the low proficiency participants ( $M = 50.00$ ,  $SD = 30.05$ ) and the difference was statistically significant ( $t(84) = -4.232$ ,  $p = .001$ ).

In addition, a mean score was calculated from the total scores on each IPS skills test item across the four measures (pre-test, post-test one, post-test two, and retention, i.e., sum total of each of the four scores for item one, a sum of item two scores, etc.). A *t*-test analysis of these means comparing low and high proficiency participants' performance yielded similar results. High proficiency participants outperformed low proficiency participants overall for each item on the IPS skills test., and the difference was also significantly significant ( $t(69) = -3.674$ ,  $p = 001$  for the total scores, as detailed in Table 28, below.

Table 28

*Comparison of IPS Skills Performance: Low versus High English Proficiency*

Item	English level	<i>Total score per item</i>			<i>t (df)</i>	<i>p</i>
		<i>n</i>	<i>M</i>	<i>SD</i>		
1 first step	low (<179)	52	40.50	14.72	-1.759 (80)	< .082
	high (>180)	30	46.46	14.83		
2 re-state	low (<179)	57	50.00	30.05	-4.232 (84)	< .001
	high (>180)	29	77.01	23.32		
3 search	low (<179)	52	42.91	15.31	-2.295 (77)	< .024
	high (>180)	27	50.93	13.51		
Total	low (<179)	45	46.71	14.01	-3.674 (69)	< .001
	high (>180)	26	58.97	12.69		

**Instructor experience.** The process evaluation outlines the practical, applied aspect of implementing an intervention under experimental conditions with three groups of students. Contrary to expectations, the reflective journal does not suggest any difficulty approaching the instruction of each treatment group differently and as designed. I had taught the research course twice before in the same setting (i.e., the MEHEI) using a regular, or traditional, approach (i.e., more teacher-centred) mixed with pockets of student-centred instruction and attention to the process rather than product of research. For this reason, beginning the treatment with a teacher-centred approach, per Renkl's (2014) example-based learning model, was not problematic.

Effort and skill, both technical and pedagogical, were both strong factors in my experience of the intervention. The level of student support provided with example-based learning, including materials development for modeling the target schema and skills and scaffolding in the form of feedback mechanisms, was much higher than with the regular

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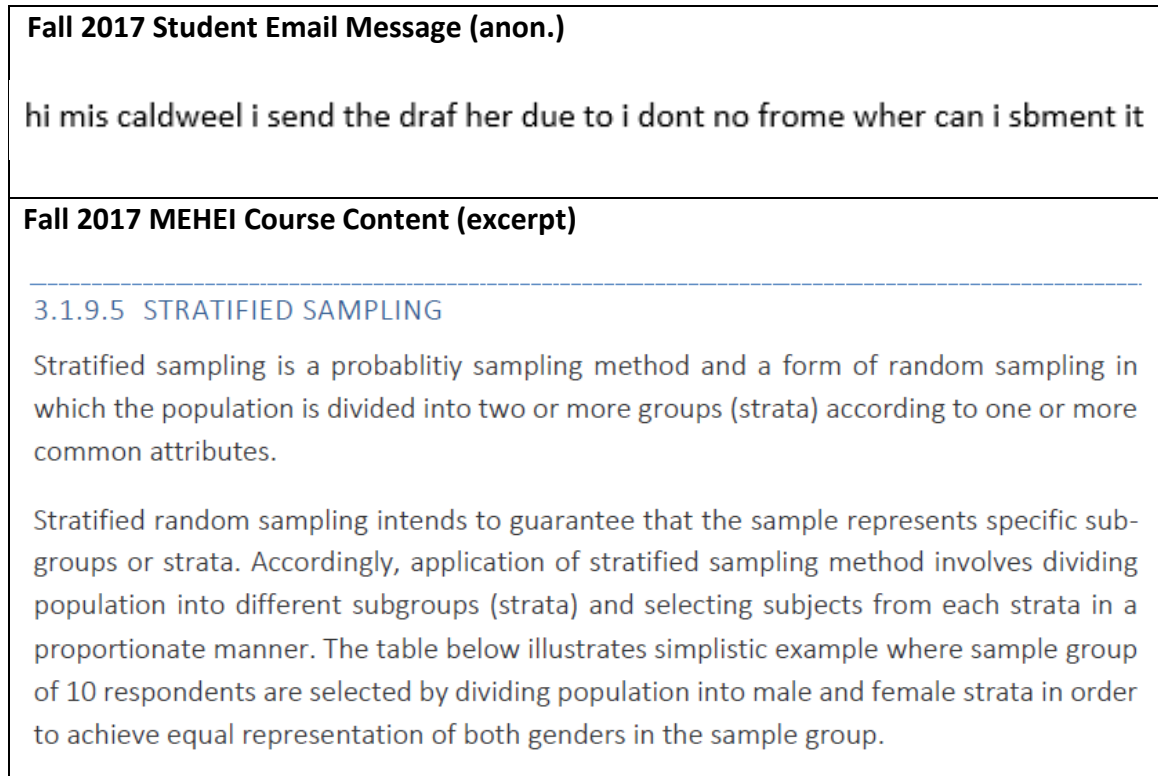
MEHEI instructional approach. Designing and developing the instruction, enacted and written worked examples, tailored prompts to orient learners to the learning domain principles, and learning experiences with an exemplifying domain that was of interest and value to students was a complex professional challenge. On reflection, this level of effort requires a great deal of commitment and iterative reflection, along with reference to theoretical, empirical, and applied instructional supports. In addition, substantial technical skills are required to design, develop, and deliver the treatment electronically, using Blackboard, the learning management system, as well as Camtasia and several other information and communications technology (ICT) resources. While the effort spent and skills gained in this experience were welcome and beneficial, I question whether most academic staff in higher education in the Gulf would be prepared to undertake these additional steps and professional learning activities to implement EBL to this extent.

Reflective journal data suggest that, in addition to the instructional design and ICT skills required to implement the EBL intervention, extensive reflection was needed. Data suggest that extensive consideration of learners' "starting point" of understanding and proficiency is a regular and central reflective practice to ensure effective delivery of EBL. Participants in the study were beginner information problem-solvers with novice-level schema and skills as well as limitations and challenges in English proficiency. Considering these factors alongside reflection on the opportunities afforded by Gulf learners' preference for teacher-centred learning was an iterative and effective practice. This reflective practice meant that learners' capacity to emulate and their passive

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approach to learning were viewed as complementary and effective factors matched to the initial teacher-centred component of EBL, direct instruction.

Finally, the constraints in the MEHEI around last-minute changes to the curriculum and assessment of the research course proved to be a substantial challenge within the treatment experience. As an instructor, I draw on numerous factors to try to motivate students, including assessment. The intervention as planned incorporated components of the research process that were designed to scaffold skills development and elicit behaviours that had been assessed in previous iterations of the course. For example, proportion of grades had previously been 20 to 30% higher for the process of developing a research focus (similar to IPS step one) and finding suitable resources (as with IPS step two). One of the changes to the course resulted in a shift in balance of content *about* the research process (i.e., vocabulary, prescribed order of steps, APA citation components) rather than the process itself. This meant that students were responsible for a large amount of information from MEHEI in-house resources. The shift to more discrete point assessment (e.g., assessments based on multiple choice items for 65% of the course grade) and a focus on the in-house materials about the research process. Given participants' language challenges, this posed a comprehension challenge, and the reflective journal data indicate that students became much more focused on memorizing the course materials (i.e., definitions) towards the second half of the course. Figure 17 below shows an email message from a student alongside an excerpt from course materials and illustrates the language proficiency challenge (not to mention the content knowledge challenge).



*Figure 17.* Student writing sample and MEHEI course materials excerpt.

This example reflects an instructional challenge when facilitating schema and skills development for novice learners. The main challenge seems to be competing notions of ‘purpose’ between national strategies (joining the knowledge economy), institutional graduate outcomes (building information literacy and critical thinking skills), course objectives and assessment practices (discrete point testing), and myriad instructional aims, not to mention the aspirations and goals of students. As outlined in a previous chapter, competing priorities related to curricular adjustments in Gulf higher education is characterized largely by and non-systematic reduction of content and extensive simplification (Aydarova, 2012; Khelifa, 2009; Sonleitner & Khelifa, 2005). The findings in the current study related to the main effect of English on performance of information problem-solving schema and skills, alongside the mismatch indicated in Figure 17

between student English proficiency levels and institutional curricular materials, shed light on the faculty response not only to competing priorities in the learning context, but also to student needs. Implementing a promising instructional intervention to develop a critically important learning domain is therefore a challenge in a complex, multi-faceted learning environment.

### **Discussion and Conclusions**

This study involved the design, development, implementation, and evaluation of an intervention, the first two phases of Renkl's (2014) instructional approach, example-based learning, in a Gulf higher education setting to develop students' information problem-solving schema and skills, based on steps one and two of Brand-Gruwel et al.'s (2009) model.

#### **Treatment Effects**

Results from the analysis suggest a treatment effect especially for the first step of information problem-solving, defining the problem, a complex, ill-defined, iterative process. During the study, IPS step one was reinforced after its initial treatment focus through a holistic overview at the beginning of the second treatment, IPS step two, searching for information. Additionally, findings indicate a confounding effect of English language proficiency but not for high school type (public versus private). These findings suggest support for the use of examples as concrete exemplars to support novice learners' schema and skills development, and are consistent with the emerging extant empirical support for the use of example-based learning in ill-structured domains without algorithmic solutions, discussed earlier. These domains include heuristic strategies,

counselling, and essay writing (Cattaneo & Boldrini, 2016; Kyun et al., 2013; Renkl et al., 2009).

As for the orienting activities, self-explanation and explanation-help, findings suggest that there was no significant difference in performance between the two treatment groups overall. However, the explanation-help group's performance was significantly stronger for information problem-solving step one, defining the problem, immediately following both treatments. Further, in terms of experience of the treatments, data suggest that the explanation-help group were more positive overall in their perceptions of the treatments than the self-explanation group, despite rating their mental effort the highest of the three groups for both treatments. On the other hand, qualitative data indicate that several self-explanation group participants perceived the treatments to be long and tiring. No such sentiments were evident in the EHG comments. Empirical research by Wittwer and Renkl (2010) and Schworm and Renkl (2006) suggests that participants have more positive views of their learning with explanation-help prompts than with self-explanation. Wittwer and Renkl (2010) suggest potential for long term retention from the instructional explanations due to positive conceptual knowledge gains. Relevant to the study context, Renkl and Atkinson (2007) note that explanation-help scaffolds may be especially well-suited to environments in which students are not yet able to sufficiently or accurately explain or communicate declarative knowledge of a learning domain principle. Taken together, these findings suggest that explanation-help scaffolds may be more effective for Gulf students with low proficiency due to participants' positive views - despite high mental effort ratings.



Given that no research on information literacy or information problem-solving instruction in the Gulf exists (Al-Muomen et al., 2012; Martin, 2016), much less on example-based learning, these results are promising, and shed light on the role of language proficiency. Further, there is a dearth of empirical exploration of elements of EBL to develop IPS in higher education globally (J. Frèrejean, personal communication, March 20, 2017), and the current study contributes to understanding of the instructional approach, learning domain, and their application and relevance in a non-Western setting.

### **Treatment Experience: Bridging Teaching and Learning**

Findings from empirical research and the current study indicate that example-based learning has potential to meet Gulf students and academic staff where they are in terms of their teaching and learning approach. The intervention treatments started with teacher-centred direct instruction of the target learning domain principles, a learning experience both familiar and preferable to Gulf students (Alalami et al., 2015; Brownie et al., 2015; Gallagher, 2011; Souleles, 2013). This preference for more didactic schooling by Gulf students was also reported in the needs analysis survey data, described earlier. Recall that the same needs analysis findings from Gulf academic staff also indicate that their teaching approach becomes more teacher-centred in the Gulf than in prior higher education settings, despite their perception that a learner-centred approach is more effective. Journal data from the intervention depict common observations that participants approached learning with more passive behaviours and reliance on collaboration. For example, data illustrate that especially at the beginning of the course, participants sat in pairs or small groups, took very few notes, and asked almost no questions. These observational data are consistent with previous empirical research by

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Diallo (2014), Souleles (2013), and Wheeler and Anderson (2010) in Gulf higher education settings which found similarly passive learning behaviour. Further, studies by Hatherley-Greene (2012) and Gallagher (2011) suggest that Gulf learners' K-12 passive learning experiences, including the emphasis on rote memorization, factor heavily in their learning behaviour in higher education and these factors shed light on participants' expectation that materials will be provided (e.g., PDF of principles) so there is little need to take notes, for example.

To the newcomer to Gulf higher education, this may be perceived as a barrier, however the intervention findings suggest that example-based learning has potential for bridging both novice students and academic staff from a passive, rote-learning approach to one that relies more on schema and skills development with scaffolding that gradually is decreased.

### **Limitations**

**Sampling.** The small number of clusters in the study was a potential issue. Torgerson et al. (2010) argue that assigning several clusters to a group is required, especially to have the power to observe important differences (p. 153), however five clusters were assigned to only three groups. This may have lead to differences among the groups that are not of statistical significance (Torgerson et al., 2010). This also exposed the study to the threat of attrition. Although not a feature specific to stratified randomized design, attrition is a threat to the reliability of randomized control trials in general (Torgerson et al., 2010) and is particularly related to the small number of clusters, especially because the control group is a single cluster. If participants had decided to

withdraw from the study at any point, generalizability of findings would especially have been affected negatively (i.e., weakened).

**Measurement.**

*Indigenization of measurement tools.* Measuring information problem-solving schema and skills using a tool and approach from a Western context was challenging. The participants in Brand-Gruwel et al.'s (2009) study, conducted in Europe, studied in a language in which they are likely proficient, and were likely quite different from Gulf learners with low and limited English proficiency, studying in English, their second language. Though adaptations were made to the measurement tool (IPS skills test), including bilingual instructions, the method of assessment was unfamiliar to students and their performance may not reflect their actual levels of IPS skills. In addition, the adjustments to the rubric also suggest the need for extensive indigenization in order to accurately reflect Gulf learners' performance. The challenges and potential pitfalls associated with the extensive adjustments to curriculum and materials without systematic oversight are important to navigate with sensitivity in Gulf higher education settings, as discussed in chapter one. Adherence to the rigour and key components of the original tools was maintained in collaboration with the study advisors, however more research is needed to validate and further understand the adaptations.

*Qualitative data.* An embedded mixed methods research design is beneficial in its broad scope of data collection, however given the dearth of research on Gulf students' perspectives, behaviours, and experiences of learning in Western-modeled higher education environments, a more ethnographic design would yield richer data and understanding, especially if the researcher spoke Gulf Arabic. Further qualitative research

that captures the student experience and related perceptions would enhance understanding of this neglected perspective. Approaches such as focus groups and think aloud protocols, conducted in participants' first language, Arabic, would complement the other measures of and contributions by students. This would also illuminate the difficulties of discerning whether learner performance reflects the learners' actual schema and skills, or their ability to demonstrate their understanding effectively and accurately through the medium of English.

***English proficiency measures.*** The English language proficiency measure was, for the majority of participants, more than two years old. The scores may not have reflected students' actual proficiency level and thus, findings of a confounding effect of English must be considered with caution.

**Academic culture.** Finally, a challenging issue related to a socio-cultural characteristic of study participants is their tendency to cooperate and collaborate extensively on all aspects of academic work, both in and out of class. During the treatment and data gathering, including the IPS test and student surveys, students made efforts to collaborate and/or copy each others' work. Measuring this behaviour is problematic and was not within the scope of this study. As discussed in chapter one, Arab-Islamic epistemology and the tendency towards passive, rote-learning approaches may be incompatible with certain Western instructional practices that engage students in individualized and active, participatory learning through constructivist or other learner-centred approaches (AlAlami et al., 2013; Brownie et al., 2015; Minnis, 1999; Minnis, 2006; Souleles, 2013). Anecdotally, this represents a daily pedagogical challenge when

learners rely on one another for task comprehension and completion, for example, and for translation of instructions and materials.

### **Implications for Research**

This study was a first attempt to indigenize an approach – Renkl’s (2014) EBL - and learning domain- Brand-Gruwel et al.’s (2009) IPS – in a Gulf setting. Replicating the study or, at minimum, testing and re-testing the tools, would enhance the validity of the adapted IPS skills test and its rubric, and provide opportunities to enhance reliability.

The positive student ratings of the treatments, combined with the findings of a treatment effect, suggest potential for further research to further examine the instructional approach, Renkl’s (2014) example-based learning, in Gulf settings. More in depth understanding of the effect of the familiar teacher-centred aspect of direct instruction, as well as the perception of having concrete exemplars (worked examples) in both enacted (modeled) and written form as scaffolds is needed. Results from empirical research in Gulf settings (Aydarova, 2012; Bashir-Ali, 2011; Belhiah & Elhami, 2015; Brownie et al., 2015; Hatherley-Greene, 2014) as well as from the current study’s needs analysis suggest that Gulf students prefer a teacher-centred approach. The needs analysis findings also suggest that faculty become more teacher-centred in the Gulf, which indicates common ground for an instructional approach like EBL. Further research is needed to investigate the extent to which the qualitative and quantitative findings from the current intervention study reflect that example-based learning and its use of direct instruction naturally builds on this common ground. Additional examination of the hybrid nature of example-based learning, which appears teacher-centred but in fact supports student independence through its anticipation of commonly experienced misconceptions and skill

deficits (Wittwer & Renkl, 2008), may reveal opportunities to expand its implementation in Gulf education settings.

In addition, the study results suggest further support for the use of concrete examples as an instructional alignment with Gulf students' skill of emulation (Bashir-Ali, 2011). Further research to better understand this relationship between concrete enacted and written worked out examples with students' ability to emulate is needed, especially in settings where learners have novice-level schema and skills in ill-structured domains such as information problem-solving. Findings from these investigations in Gulf settings could be compared to empirical research of the use of example-based learning in ill-structured domains such as heuristics strategies, argumentation, counselling, and essay writing (Atkinson et al., 2000; Cattaneo & Boldrini, 2016; Kyun et al., 2013; Renkl et al., 2009; Schworm & Renkl, 2007).

To better understand the type of EBL scaffolds to effectively orient Gulf students to the target principles and rules of the learning domain, further research to build on the findings in the current study regarding self-explanation and explanation-help is needed. While the differences between the SEG and EHG at retention were not significant, the findings following both treatments that suggest significant gains by the EHG versus the SEG are noteworthy, especially in light of the EHG participants' more positive ratings of the treatments. This is in spite of their higher mental effort ratings. For Gulf and other students who are less proficient in English and therefore not yet able to accurately explain declarative knowledge of a principle, research to understand the most effective orienting activity is needed.

Finally, information literacy, including its sub-skill, information problem-solving, represents not only a basic human right (UNESCO, 2016) and meta-competency of the knowledge economy (Lloyd, 2003), but also, according to Bruce (2002), a critical literacy with potential to be a catalyst to transform the information society into the learning society of tomorrow. Nonetheless, IL and IPS remain underrepresented in higher education curricula and classrooms (Walraven et al., 2008; Weiner, 2014). At the same time, findings from empirical research (Badke, 2005; Kracker, 2002) and the needs analysis indicate that faculty have knowledge and skills gaps related to information literacy. In light of the academic, professional, and social importance of IL and IPS, further research to address the schema and skills for success in a knowledge economy is crucial.

### **Implications for Practice**

As noted earlier, example-based learning and its incorporation of direct instruction and the use of concrete examples as scaffolds has potential to meet Gulf academic staff and students where they are in terms of their teaching and learning approach. Given the empirical evidence of non-systematic reduction and simplification of content – by up to two-thirds (Aydarova, 2012), complemented and supported by the needs analysis findings, EBL may represent a highly structured framework to build student capacity (schema and skills), rather than reduce learning expectations. EBL offers a straightforward instructional approach with decades of empirical support (Atkinson et al., 2000) for its effectiveness in diverse settings with both well- and ill-defined learning domains. Further, with its use of scaffolds – and their gradual reduction – EBL facilitates learner independence.

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Time is another important implication of this study. Designing, developing, implementing, and evaluating example-based learning, especially high quality, effective written and enacted worked examples, is complex and requires substantial time commitments. I have a background in education and instructional design, however a substantial portion of Gulf higher education academic staff do not. Both the time commitment and requisite pedagogical skills might preclude others from implementing EBL in their instruction. Therefore, scaling the treatment may require more of an institutional commitment to EBL as well as to information problem-solving for its success. The opportunities for scaling and sustaining the positive and beneficial aspects of the treatment and its learning domain, information problem-solving, are extensive due to its flexibility of delivery using technology and the Internet. That is, despite its significant design and development investments, discussed above, there is great potential for sharing and disseminating EBL materials to develop information problem-solving through the use of multi-media platforms and sharing the materials via the world wide web and other networks.

Finally, as discussed earlier, institutional support and prioritization of information problem-solving as an iterative process of schema and skills development is lacking not only in Gulf higher education, but in many international settings. In order for faculty and other academic staff to invest the time and reflection required for professional schema and skills development, there may need to be greater support at an institutional and curricular level for IPS with an emphasis on process rather than material *about* IPS, and discrete point assessment thereof.



### Conclusions

The process, outcomes, and experiences of implementing and evaluating an instructional approach and a learning domain that originate from Western epistemological and socio-cultural contexts in a novel environment is a complex endeavour. It requires attention to the rigours and standards of empirical research so that findings can be understood within a broad community of peers. Moreover, and perhaps more importantly, it requires careful consideration of the social and cultural systems in which the intervention will be experienced. During this research and instructional experience, certain metaphors have emerged to frame the factors of the problem of practice, and to consider interventions to effect change.

First, the gap between Gulf students' Arab-Islamic K-12 academic culture and that of the Western-modeled higher education environment can be understood through Hatherley-Greene's (2014) *cultural border crossing* lens. Then, there is the schema and skills gap in learners' information problem-solving process, and the resulting gap between graduates' skills and the needs of Gulf knowledge economy employers. For this, we have Hvidt's (2015) characterization of Gulf learners *leapfrogging* as a means to closing the gap by somehow bypassing the constructivist, active learning developmental learning processes as part of iterative schema and skills building. Two challenging processes – a cultural border crossing across a socio-cultural gap, and leapfrogging over important learning processes. At the end of this experience that began with academic staff perceptions and ended with students' and my own experiences, I see a bridge that has potential to facilitate both challenging processes. The bridge is made up of the instruction and scaffolding of example-based learning and the meta-competency of information

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literacy and its sub-skill, information problem-solving. Example-based learning can bridge both students and academic staff and scaffold both teaching and learning processes towards more constructivist, learner-centred classroom experiences. Similarly, information problem-solving, as part of information literacy, represents the essential skill, according to Lloyd (2003) and the catalyst to transform society (Bruce, 2002). As such it can bridge the schema and skills gap as an alternative to leapfrogging over the iterative, sometimes difficult, progression from novice to expert information problem solvers and engaged participants in the Gulf knowledge economy.

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## Appendices

### *Appendix A: Factors that Influence Information Literacy Development*

Theme	Sub-theme	<i>n</i>
Previous Learning (Training, Background)	education (K-12)	57
	critical thinking	27
	IL / research	24
	study habits	21
	plagiarism	16
	search skills (reliance on Google)	14
	background / experience (?)	13
	rote learning	9
	IT skills	8
	awareness of library	8
	background knowledge	5
	managing information	3
	education level (?)	3
	content creation	2
	writing (?)	1
skills (?)	1	
	sub-total	212
Socio-cultural Influences	culture	45
	motivation	33
	interest / curiosity	12
	epistemology	11
	independence (lack of)	9
	socio-economic status	9
	gender	5
	peers' influence	4
	overconfidence	4
	outside commitments	3
	attention span (interest?)	3
	age	2
	sleep	1
	mismatch (West-East)	1
	sub-total	142
Language / Literacy	reading / literacy	29
	English language	24
	L1	3
		sub-total

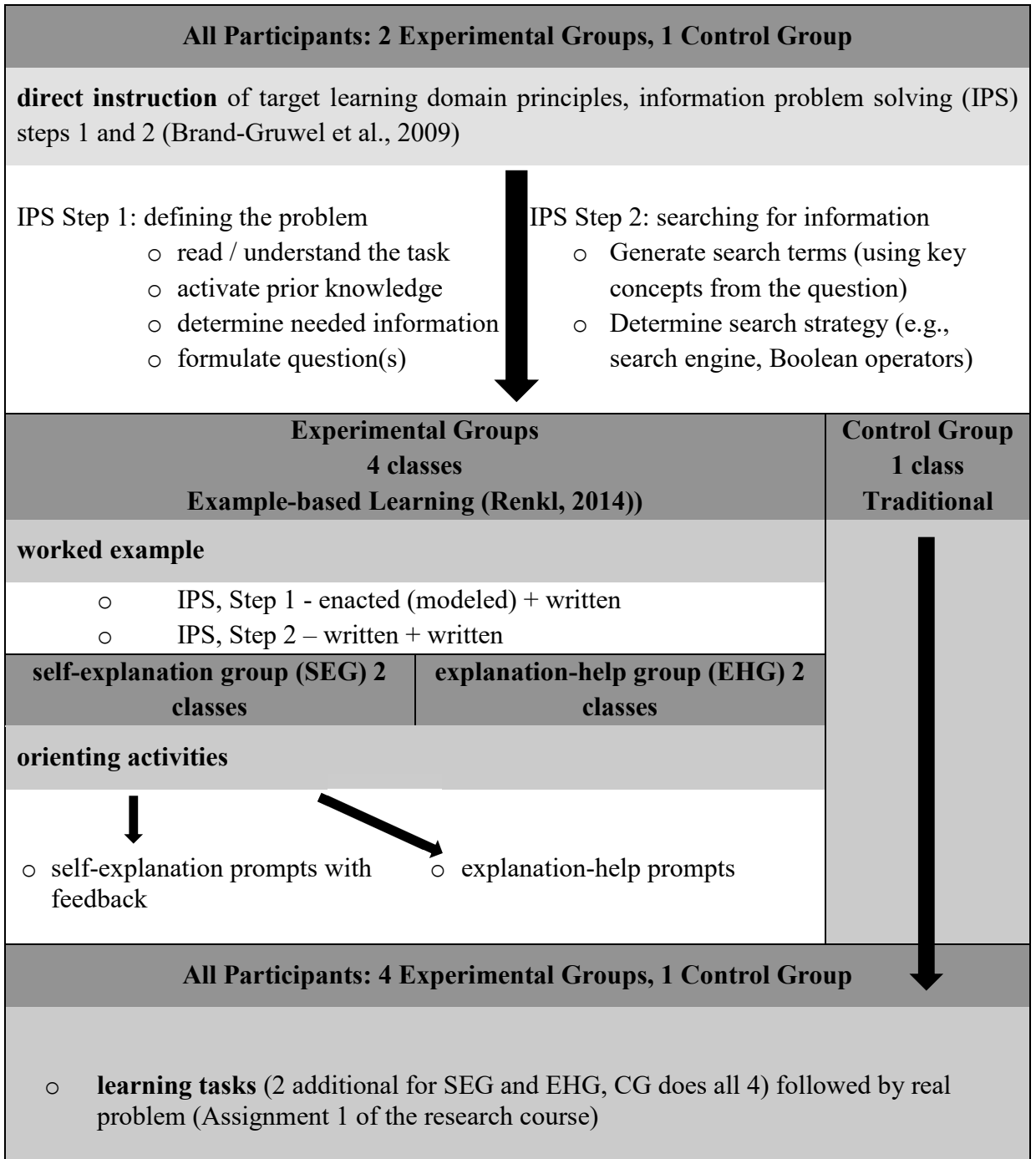


## Appendices

Current	pedagogy	23
Learning	institutional – emphasis,	18
Context	infrastructure	
	whether IL taught, graded	10
	institutional – insist on digital	1
	Ss' choice	1
	sub-total	53

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*Appendix B: Adherence checklist*



*Appendix C: Original Treatment Schedule*

**Key:** red text = research design; highlighted red text = measurement/data gathering activity; green text = example-based learning component (the intervention)

when	data collection	control group (CG)	self-explanation (SEG)	explanation-help (EHG)
week 1, class 1 (week of Aug. 20, 2017)	<ul style="list-style-type: none"> <li>initiate <b>recruitment</b> – Emirati colleague by video, after intro to the course</li> <li>R-I initiates <b>reflective journal</b> writing, annotates <b>adherence checklist</b> and refers to <b>colour-coded schedule</b> (as needed)</li> <li><b>moderating variables</b> online demographics survey – academic culture (K-12 background, English proficiency, IL awareness and experience (ICT, library) including at MEHEI, end of class</li> </ul>	<p><b>whole task approach</b> – introduction to the course, Introduction to Scientific Research &amp; Development</p> <ul style="list-style-type: none"> <li>broad discussion about research and the research process</li> <li>general components of the course structure with example of completed research paper</li> </ul>		
week 1, class 2	<ul style="list-style-type: none"> <li><b>recruitment</b> follow up</li> <li><b>IPS skill</b> (Frèrejean et al., 2016) – <b>pre-test measure</b>, end of class</li> </ul>	<p><b>exemplifying domain, background knowledge</b></p> <ul style="list-style-type: none"> <li>individual Internet search about UAE Vision 2021 + interactive comprehension building activities</li> </ul>		

Appendices

when	data collection	control group (CG)	self-explanation (SEG)	explanation-help (EHG)
		<ul style="list-style-type: none"> <li>• read one source related to UAE Vision 2021 (cited in example research paper - builds background knowledge and lays the groundwork for later work with lit review); comprehension activities</li> <li>• examine example research paper – build familiarity with course outcome</li> </ul>		
week 2, class 1	<ul style="list-style-type: none"> <li>• <b>IPS behaviour, pre-test measure</b> after IPS skill measurement</li> <li>• <b>recruitment</b> follow up</li> </ul>	<p><b>exemplifying domain, background knowledge</b></p> <ul style="list-style-type: none"> <li>• reinforce, check understanding UAE Vision 2021, link to MEHEI graduate outcomes (to be used as exemplifying domain in worked examples)</li> <li>• comprehension building activities for exemplifying domains (UAE Vision 2021, MEHEI graduate outcomes)</li> </ul>		
week 2, class 2	<ul style="list-style-type: none"> <li>• <b>comprehension / understanding</b> of <b>exemplifying domains</b> beginning of class so that feedback activity can proceed after</li> <li>• <b>recruitment</b> follow up; complete <b>stratified randomization of clusters</b> to experimental conditions; ensure <b>recruitment data</b> (forms, identity) is secure</li> </ul>	<ul style="list-style-type: none"> <li>• formative comprehension / understanding assessment of <b>exemplifying domains</b></li> <li>• immediate feedback; reinforce, understanding</li> <li>• introduce Assessment 1 – Research Plan (<b>real problem</b> to be solved)</li> </ul> <p><b>direct instruction of learning domain principles</b> (IPS step 1 – define the problem)</p> <ol style="list-style-type: none"> <li>1. understand the task (ask questions, identify key words, check understanding)</li> <li>2. activate prior knowledge</li> <li>3. determine needed information (list everything needed to complete the task (solve the problem))</li> <li>4. formulate question(s) (preliminary research question to guide next step, IPS step 2, information search)</li> </ol>		

when	data collection	control group (CG)	self-explanation (SEG)	explanation-help (EHG)
	<ul style="list-style-type: none"> <li>• create <b>colour-coded schedule</b> (illustrating treatment and control groups)</li> </ul>			
<p><b>week 3, class 1</b></p>	<ul style="list-style-type: none"> <li>• <b>Ss' online submissions</b> - constructed responses to learning tasks (control group) and self-explanation prompts (SEG)</li> <li>• <b>Student evaluation of training</b> - Ss complete 4 brief Qs after training</li> <li>• <b>Ss' notes</b> – collect, copy (and return) notes taken during lesson</li> </ul>	<ul style="list-style-type: none"> <li>• 2 learning tasks (same academic research problems as worked examples used with SEG and EGH but without any prompts)</li> <li>• Ss enter response to problem (4 sub-skills of IPS step 1)</li> <li>• immediate feedback</li> <li>• Ss can take notes</li> </ul>	<ul style="list-style-type: none"> <li>• <i>enacted</i> (video) worked example of academic research problems with <b>self-explanation</b> prompts for each of the 4 sub-skills of IPS step 1 (pause, prompt, Ss' response, feedback cycle for each pause)</li> <li>• Ss can also pause and take notes as needed</li> <li>• <i>written</i> worked example (isomorphic problem) with 4 <b>self-explanation</b> prompts (same cycle)</li> <li>• Ss can take notes</li> </ul>	<ul style="list-style-type: none"> <li>• <i>enacted</i> (video) worked example of academic research problem with <b>explanation-help</b> prompts for each of the 4 sub-skills of IPS step 1</li> <li>• Ss can pause and take notes, as needed</li> <li>• <i>written</i> worked example (isomorphic problem) with 4 <b>explanation-help</b> prompts</li> <li>• Ss can take notes</li> </ul>

Appendices

when	data collection	control group (CG)	self-explanation (SEG)	explanation-help (EHG)
week 3, class 2	<ul style="list-style-type: none"> <li>• <b>Ss' notes</b> – collect, copy (and return) notes taken during lesson</li> <li>• <b>IPS skill (post-treatment)</b> and <b>cognitive load / mental effort</b>, end of class, after learning tasks</li> </ul>	<ul style="list-style-type: none"> <li>• 2 learning tasks (isomorphic academic problems)</li> <li>• Ss enter response (4 sub-skills of IPS step 1)</li> <li>• immediate feedback (answers)</li> <li>• Ss can take notes</li> </ul>		
week 4, class 1	<ul style="list-style-type: none"> <li>• <b>Ss' online submissions</b> - constructed responses to academic research <b>problem (real)</b> for formative feedback (for Ss) and analysis (qualitative data for outcome evaluation)</li> </ul>	<ul style="list-style-type: none"> <li>• review, reinforce <b>exemplifying domain</b> (UAE Vision 2021)</li> <li>• <b>feedback</b> on learning tasks (whole class session, general issues / problems)</li> <li>• academic research <b>problem (real)</b> - Assessment 1 Task (Research Plan, 5%) – formative evaluation</li> <li>• Ss begin to <b>solve problem</b> (respond to Assessment 1 task description) by completing the 4 sub-skills of IPS step 1 and submit (for formative feedback):               <ol style="list-style-type: none"> <li>1 - their understanding of the task (reformulation)</li> <li>2 - description of their prior knowledge</li> <li>3 - description of the information they will need</li> <li>4 - an initial research question</li> </ol> </li> </ul>		

when	data collection	control group (CG)	self-explanation (SEG)	explanation-help (EHG)
week 4, class 2		<p><b>learning domain (IPS step 1) and exemplifying domain (UAE Vision 2021)</b>                      reinforcement, development</p> <ul style="list-style-type: none"> <li>formative feedback, address areas in need of attention based on observations, Ss' work (notes) and initial review of submitted work</li> </ul> <p><b>whole task approach</b></p> <ul style="list-style-type: none"> <li>'big picture' review - reinforce course subject (research) and exemplifying domain (Vision 2021) and assessments for the course</li> </ul> <p><b>direct instruction</b> of learning domain principles (IPS step 2 – information search)</p> <ol style="list-style-type: none"> <li>Generate search terms (using key concepts from the question)</li> <li>Determine search strategy (e.g., search engine, Boolean operators)</li> <li>Execute search</li> </ol>		
week 5, class 1	<ul style="list-style-type: none"> <li><b>Ss' notes</b> – collect, copy (and return) notes taken during lesson</li> <li><b>Student evaluation of training</b> - Ss complete 4 brief Qs after training (same as with earlier training for IPS, step 1)</li> <li><b>Ss' online submissions</b> - constructed responses to learning tasks (control group) and self-explanation prompts (SEG)</li> </ul>	<ul style="list-style-type: none"> <li>2 learning tasks (same academic problems as earlier in course)</li> <li>feedback in the form of instructional prompts</li> <li>Ss can take notes</li> </ul>	<ul style="list-style-type: none"> <li>2 <i>written</i> worked examples (same academic problems as earlier in course) with 2 <b>self-explanation</b> prompts (first 2 sub-skills)</li> <li>pause, prompt, Ss' response, feedback cycle for each pause</li> <li>Ss can take notes</li> </ul>	<ul style="list-style-type: none"> <li>2 <i>written</i> worked examples (same academic problems as earlier in course) with 2 <b>explanation-help</b> prompts (first 2 sub-skills)</li> <li>Ss can take notes</li> </ul>

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when	data collection	control group (CG)	self-explanation (SEG)	explanation-help (EHG)
week 5, class 2	<ul style="list-style-type: none"> <li>• <b>Ss' notes</b> – collect, copy (and return) notes taken during lesson</li> <li>• <b>IPS skill (post-treatment)</b> and <b>cognitive load / mental effort</b> [end of learning tasks]</li> </ul>	<ul style="list-style-type: none"> <li>• 2 learning tasks (same isomorphic academic problems as earlier)</li> <li>• Ss enter response (first 2 sub-skills of IPS step 2)</li> <li>• immediate feedback (answers)</li> <li>• Ss can take notes</li> </ul>		
week 6, class 1	<p><b>Ss' online submissions</b> - constructed responses to <b>problem (real)</b> for formative feedback (for Ss) and analysis (qualitative data for outcome evaluation)</p>	<p><b>learning domain (IPS steps 1 and 2)</b> and <b>exemplifying domain (UAE Vision 2021)</b> reinforcement, development</p> <ul style="list-style-type: none"> <li>• address areas in need of attention based on observations and initial review of submitted work</li> <li>• <b>formative feedback</b> to individuals on Assessment 1 submissions (this work will form the basis of the next step – searching – so careful checking and clarification is important at this stage)</li> </ul> <p><b>problem (real)</b> - Assessment 1 Task (Research Plan, 5%) – formative evaluation Ss continue to solve the real problem (respond to Assessment 1 Task Description) by completing the 3 sub-skills of IPS step 2 and submit:</p> <ul style="list-style-type: none"> <li>• search terms and search strategy</li> </ul>		
<ul style="list-style-type: none"> <li>• main focus of research ends here (intervention for IPS steps 1 and 2 completed)</li> <li>• Ss receive formative feedback on their search terms and search strategy work before completing the real problem (Assessment 1 – Research Plan)</li> </ul>				



Appendices

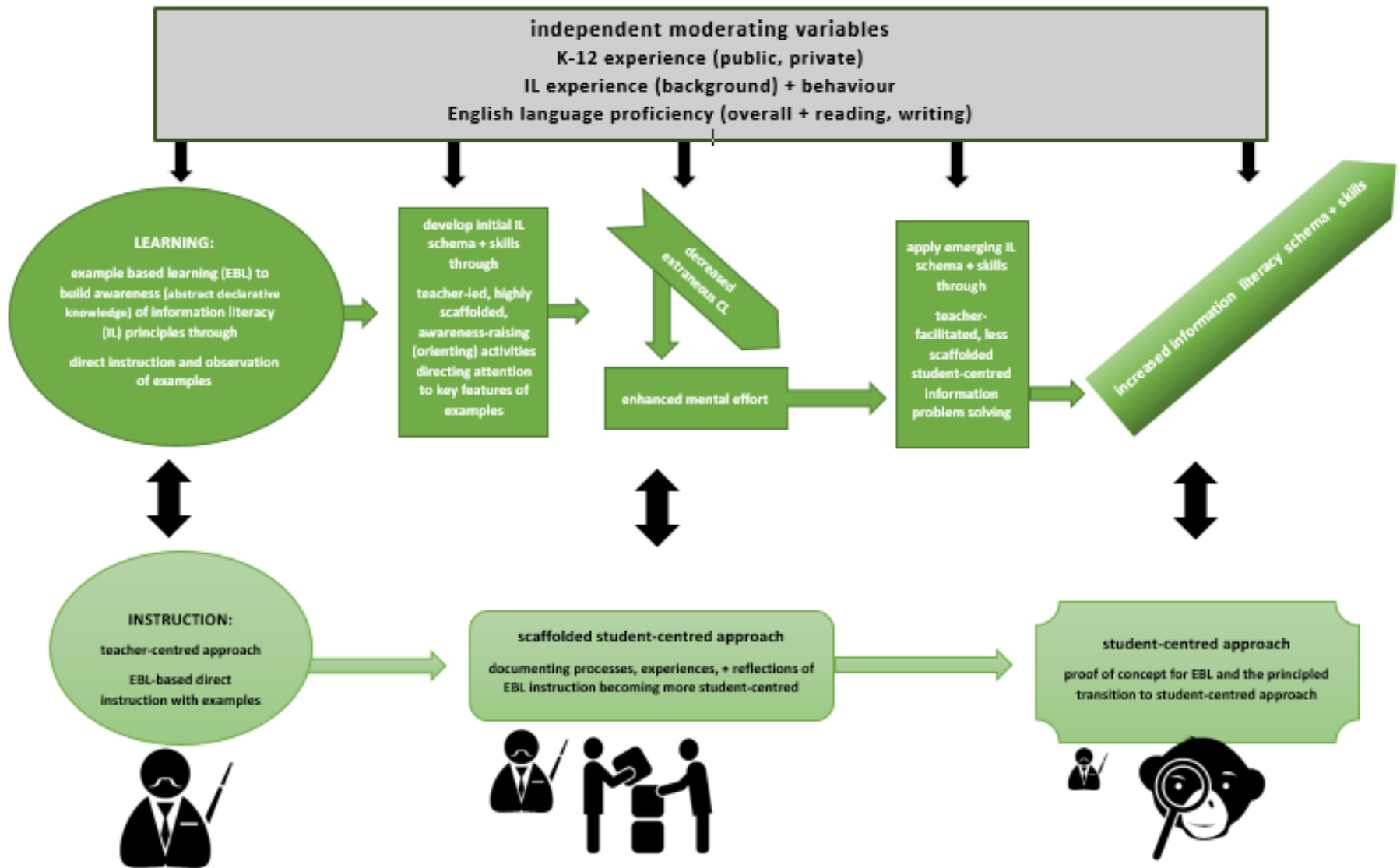
when	data collection	control group (CG)	self-explanation (SEG)	explanation-help (EHG)
<ul style="list-style-type: none"> <li>Ss will use steps 1 and 2 in the course two more times, when they need to find more sources (1) for their literature reviews; (2) to narrow their lit review focus to include content from surveys or opinion pieces; and (3) surveys themselves to adapt or use as models</li> <li>research journal writing continues, including observations of Ss' continued IPS</li> <li>retention measures of IPS skill (post-treatment), IPS behaviour, and student evaluation of training in penultimate week of semester</li> </ul>				
week 6, class	<p><b>whole task approach</b></p> <ul style="list-style-type: none"> <li>'big picture' review - reinforce course subject (research) and exemplifying domain (Vision 2021) and assessment 1 (focus now turns to parameters for source selection (evaluation))</li> <li>formative feedback on Assessment 1 work</li> </ul>			

Appendices

*Appendix D: Colour-coded Schedule*

	<b>Sun</b>	<b>Mon</b>	<b>Tues</b>	<b>Wed</b>	<b>Thurs</b>
<b>08:00</b>	EHG	SEG	EHG	SEG	
<b>09:00</b>	section 10200	section 10060	section 10200	section 10060	
<b>10:00</b>					
<b>11:00</b>					
<b>12:00</b>					
<b>13:00</b>					
<b>14:00</b>	EHG	SEG	EHG	SEG	
<b>15:00</b>	section 10205	section 10059	section 10205	section 10059	
<b>16:00</b>	CTRL		CTRL		
<b>17:00</b>	section 10210		section 10210		

Appendix E: Theory of Treatment



*Appendix F: Logic Model*

<b>inputs</b>	<b>activities</b>	<b>outputs</b>	<b>short-term outcomes</b>	<b>medium-term outcomes</b>	<b>long-term outcomes</b>
Institutional policy requiring the course, <i>Basic Methods of Scientific Research</i> for General Studies (GS) credits	GS program manager assigns up to five sections ( $n \approx 30$ each) of course to R-I				
undergraduate students (Ss) at the institution	Ss register for and attend research classes, and engage in learning and assessment activities related to IPS steps 1 and 2 (defining the problem + information search)	Ss develop the capacity to engage in IPS steps 1 and 2, and collect (and manage) related digital and paper-based reference materials (i.e., their notes and annotated learning materials for future applications in information problem-solving)	Ss' enhanced IPS initial schema + skills (defining the problem + information search) to develop research plan (annotated bibliography) increase in Ss' awareness + experience of IPS	Ss apply initial schema + skills of steps 1 and 2 of IPS (defining the problem + information search) to complete literature review and create data gathering instrument Ss correct and refine IPS schema and skills	Ss apply IPS in their other courses and in their personal and future professional lives
instructional, theoretical, and empirical resources to inform design + development of	researcher-instructor (R-I) develops EBL materials + instruction tailored	R-I facilitates research course according to control and experimental group parameters	increase in academic staff's awareness + understanding of the use of EBL		increase in academic staff's application of EBL instruction principles to

Appendices

<p>activities and materials based on Renkl's (2014) instructionally oriented theory of example-based learning (EBL) to target the learning domain of information problem solving (IPS) steps: defining the problem + information search (Brand-Gruwel et al., 2009)</p>	<p>for Ss' academic culture (teacher-centred), English language and IL background + experience levels</p> <p>R-I documents EBL-related instructional processes + reflections on teacher- to student-centred adjustments</p>	<p>EBL activities + materials to develop schema + skills of target IPS components, tailored for Ss' English language and IL levels</p> <p>Process + outcome measures and sample materials to inform / support professional development (PD) workshop to share proof of concept - teacher- to student-centred instruction using EBL</p>	<p>instruction to facilitate Ss' schema and skill development and their own instruction from teacher- to student-centred</p>		<p>facilitate Ss' schema and skill development in their courses, and to adjust their own instruction from teacher- to student-centred</p>
<p><b>assumptions</b></p>	<p>features of Ss' academic culture, including a preference for teacher-centred learning, may impact the intermediate stage (scaffolded problem solving) and final stage (more independent problem solving) of the treatment, as they involve more student-centred learning and independent application of the schema and skills</p>				
<p><b>external factors</b></p>	<p>some Ss may not be novices in IPS or have low English proficiency academic staff may not attend voluntary PD session, and those who do may not apply EBL in their courses due to introductory nature of the session and the absence of training</p>				

*Appendix G: Evaluation Summary Matrix*

<b>Research focus</b>	<b>Indicator</b>	<b>Data source</b>	<b>Frequency</b>
RQ1 – changes in IPS skills as a result of receiving worked examples (proximal outcome, outcome evaluation)	<ul style="list-style-type: none"> <li>IPS skill level</li> </ul>	<ul style="list-style-type: none"> <li>IPS skills test (participants who received treatment)</li> </ul>	four times: pre-test (week 1), post-treatment practice (2 treatments), and retention (week 16)
RQ2 – differences in achievement of IPS skills between 2 treatment and 1 control group	<ul style="list-style-type: none"> <li>IPS skill level</li> </ul>	<ul style="list-style-type: none"> <li>IPS skills test</li> </ul>	as above
RQ3 – difference in IPS behaviour as a result of receiving worked examples (distal outcome)	<ul style="list-style-type: none"> <li>IPS behaviour ratings</li> </ul>	<ul style="list-style-type: none"> <li>IPS behaviour survey</li> </ul>	twice: pre-test (week 1) and retention (week 16)
RQ4 – what results emerge from qual. and quan. data (distal outcome, proof of concept)	<ul style="list-style-type: none"> <li>patterns</li> </ul>	<ul style="list-style-type: none"> <li>collated results and analysis of performance (IPS skills) and behaviour with qualitative</li> </ul>	as above (QUAN) and ongoing (QUAL)
Process evaluation – Fidelity of components and implementation of intervention (Renkl’s (2014) EBL)			
Process Evaluation – Fidelity <i>Adherence</i>	<ul style="list-style-type: none"> <li>intervention: first two phases of Renkl’s (2014) EBL</li> </ul>	<ul style="list-style-type: none"> <li>instructional, theoretical, and empirical resources (design + dev)</li> </ul>	ongoing

Appendices

Research focus	Indicator	Data source	Frequency
	<ul style="list-style-type: none"> <li>• learning domain: IPS (Brand-Gruwel et al., 2009) steps 1 and 2</li> </ul>	<ul style="list-style-type: none"> <li>• adherence checklist (Appendix B)</li> <li>• reflective instructional journal</li> </ul>	
Process Evaluation – Fidelity <i>Dose</i>	<ul style="list-style-type: none"> <li>• full participation (in all intervention-related activities) and attendance</li> <li>• independent participation</li> </ul>	<ul style="list-style-type: none"> <li>• MEHEI attendance records</li> <li>• Reflective instructional journal</li> <li>• Treatment schedule (Appendix C)</li> </ul>	attendance entered daily QUAL ongoing
Process Evaluation – Fidelity <i>Program differentiation</i>	<ul style="list-style-type: none"> <li>• delineation of 3 intervention conditions</li> </ul>	<ul style="list-style-type: none"> <li>• colour-coded schedule</li> <li>• adherence checklist (Appendix B)</li> <li>• reflective instructional journal</li> <li>• student evaluation of learning</li> <li>• management of resources in LMS through grouping functions</li> </ul>	as above

## IPS Skills Test 1 (baseline)

Hello and thank you for doing this survey!

مرحباً و شكراً لإشتراككم في هذه الدراسة الاستقصائية.

This is NOT a test. There is no grade. Also, there is no "right" or "wrong" answer.

هذه الأسئلة ليست إمتحان. لا يوجد علامة و ليس هناك جواب خطأ أو صح.

We want to know how you begin to work on your assessments in college. Please answer honestly and report what you normally do.

نريد أن نعرف كيف تبدأ في العمل على الواجبات في الكلية. يرجى الإجابة بصدق وكتابة ما تفعل عادة.

Please ask your teacher, Mrs. Caldwell, if you have any questions.

الرجاء أن تسأل أستاذتك، الأنسة كالدويل إذا كان عندك أي سؤال.

Which section are you in?

- 10059 (Mon 2pm; Wed 2pm)
- 10060 (Mon 8am; Wed 8am)
- 10200 (Sun 8am; Tues 8am)
- 10205 (Sun 2pm; Tues 2pm)
- 10210 (Sun 4pm; Tues 4pm)

Please enter your Student ID number

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[page break]

**Imagine that your teacher gives you this assignment in one of your courses:**

تخيل أن الأستاذ قد أعطاك هذا الواجب في أحد دوراتك:

*The Arabian Gulf has more and more visitors each year from all around the world. How does this affect the culture of the Gulf? Gulf economy? The environment? Write a 750-word essay about this issue using at least three high quality sources. Format your essay with APA.*



## Appendices

[item 1] How would you start this assignment? What is your first step o do this work, and why?

كيف تبدأ بالإجابة على هذا الواجب؟ ماهي الخطوة الأولى لإنجاز هذا الواجب، ولماذا؟

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[page break]

Imagine that your teacher gives you this assignment in one of your courses:

تخيل أن الأستاذ قد أعطاك هذا الواجب في أحد دوراتك:

*The Arabian Gulf has more and more visitors each year from all around the world. How does this affect the culture of the Gulf? Gulf economy? The environment? Write a 750-word essay about this issue using at least three high quality sources. Format your essay with APA.*

[item 2] What do you have to do, exactly? Explain the assignment in your own words.

ماهو الواجب؟ الرجاء أن تشرح ماهو مطلوب مستخدماً كلمات غير الموجودة في السؤال؟

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[page break]

Imagine that your teacher gives you **this assignment in** one of your courses:

تخيل أن الأستاذ قد أعطاك هذا الواجب في أحد دوراتك:

*The Arabian Gulf has more and more visitors each year from all around the world. How does this affect the culture of the Gulf? The Gulf economy? The environment? Write a 750-word essay about this issue using at least three high quality sources. Format your essay with APA.*

[item 3] What would you type into Google?

ماهي الكلمات التي تبحث عنها في الجوجل؟

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prompts for all four IPS skills tests

IPS1 (baseline)

*The Arabian Gulf has more and more visitors each year from all around the world. How does this affect the culture of the Gulf? Gulf economy? The environment? Write a 750-word essay about this issue using at least three high quality sources. Format your essay with APA.*

## Appendices

IPS2 (post-test 1)

***Leadership is more important in today's changing world than any other time in history. Write a 750-word report on one of the most common leadership styles in the world, and compare it to the leadership in the UAE. Discuss politics, society, and family. Use at least three high quality sources, and format with APA.***

IPS3 (post-test 2)

***Many people believe that the education system in school and higher education must change to meet the employment needs of the future. Write a 750-word report on this topic in your country, and compare it to one other country. Discuss school (kindergarten to grade 12) and higher education such as college and university. Use at least three high quality sources, and format with APA.***

IPS4 (retention)

***Nowadays, the ability to use technology is required not only in school but also in social and professional / work life. Write a 750-word report on this topic in your major. Discuss the importance of technology in your studies and your future career. Use at least three high quality sources, and format with APA.***

## Appendices

### *Appendix I: IPS Skills Test Rubric*

The rubric depicts the target skills and knowledges associated with information problem solving (per the work by Brand-Gruwel and colleagues). The descriptions below are from Frèrejean et al. (2016) and Frèrejean, (personal communication).

Q1 assesses the skill, defining the problem and the subskill of problem orientation based on a given problem description. This is the first step of IPS.

Q2 assesses the skill defining the problem and the subskill of formulating a problem statement based on a given problem description. This is part of the first step.

Q3 assesses the skill of searching for information and the subskill of generating search terms based on a given problem description. This is the initial phase of step 2 of IPS.

Q1	How would you <u>start</u> this assignment? What is your <u>first step</u> to do this work, and <u>why</u> ? <b>(maximum 2 points)</b>
0	starts searching right away OR unclear response (e.g., begins answering the Q itself, writes opening text for essay/response)
+1	orienting activity – reads carefully, asks Qs to ensure understanding, plans (brainstorms, makes map), thinks OR activates prior knowledge
+1	addresses task demands – determines information needs or types of sources, formulates a question

Q2	What do you have to do, exactly? Explain the assignment <u>in your own words</u> . <b>(maximum 2 points)</b>
0	irrelevant OR inaccurate OR extremely vague <b>very</b> general about research or IPS steps (repeating Q1) OR begins answering the Q itself
1	relevant (paraphrases/refers to <b>topic</b> OR <b>task requirements</b> ) but incomplete OR formulated vaguely
2	contains ALL relevant concepts of the topic (see below) or task (750 words, 3 good sources, use APA)
	IPS4 (should have the 3 bullet points to score 2; just technology = 0) <ul style="list-style-type: none"> <li>• importance of technology (school and professional / work life)</li> <li>• in your major / specialization / department at college</li> <li>• in your future career</li> </ul> IPS3

## Appendices

	<ul style="list-style-type: none"> <li>• education system must change</li> <li>• employment</li> <li>• school and higher education</li> <li>• UAE + other</li> <li>• compare</li> </ul> <p>IPS2</p> <ul style="list-style-type: none"> <li>• leadership (styles)</li> <li>• Arabian Gulf + world/other</li> <li>• politics, society, family</li> <li>• compare</li> </ul> <p>IPS1:</p> <ul style="list-style-type: none"> <li>• Arabian Gulf</li> <li>• visitors / tourists</li> <li>• culture, economy, environment</li> <li>• affect</li> </ul>
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Q3	What would you type into Google? ( <b>maximum 4 points</b> )
0	<p>no key terms OR irrelevant overall (misunderstood task) OR is too general / vague and does not address the <b>key aspects</b> of the Q (MAX 1 if only one of these key aspects there)</p> <ul style="list-style-type: none"> <li>• IPS4 = technology AND study and/or (career OR job OR employment) AND major <i>technology required with study or career for score of more than one major required for score of 4</i></li> <li>• IPS3 = ((Arabian) Gulf OR country) AND education OR employment</li> <li>• IPS2 = (Arabian) Gulf AND leader(ship)</li> <li>• IPS1 = (Arabian) Gulf AND visitors/tourists</li> </ul>
+1	<p>add a point for every relevant search term/string (noun phrase) or its synonym maximum of 1 point overall for language such as 'key words' maximum of 3 points overall if only search terms, no systematic pattern</p>
+1	<p>add a point for systematic pattern e.g., attempt at Boolean operator, parentheses</p>
4	<p>score of 4 is only if systematic pattern (Boolean operator, parentheses) is included</p>

*Appendix J: Problem Scenarios*

**Research Project (35%) ~ What can I do for *Vision 2021*?**

Imagine that you join the *Vision 2021* team for your college. You travel to Abu Dhabi to attend the first meeting, hosted by H. H. Sheikh Mohammed bin Rashid Al Maktoum. At the meeting, he explains that the UAE must look carefully at “the trends and challenges that will face us... and start with a deep and honest analysis of our current situation” ([UAE Vision 2021](#), p. 4).



*A deep and honest analysis* is part of the research process. In this course, you will conduct scientific research into the challenges for Emiratis in the work place – both private and public.

You will design and conduct scientific research to understand one of the challenges, and to consider a solution. You will follow the steps of scientific research.

The **research project** must be about the UAE and linked to the college and will have two sections:

a **report** with three parts (25%):

- a. literature review = 400-600 words, synthesizing a minimum of three high quality sources, one from the library database
- b. methodology = survey, interviews, or focus groups
- c. results, analysis, discussion, conclusion and recommendations = 350-500 words

and a **presentation** of your research (10%):

- d. recorded video or presentation OR presentation in class of your research experience = 6 - 8 minutes

**Challenge 1:**

Vision 2021 calls for a “customer-centric approach”. This requires a high level of problem-solving in English. For this reason, private sector employers prefer to hire expatriates with strong English skills. Design and conduct scientific research into this problem and a possible solution.

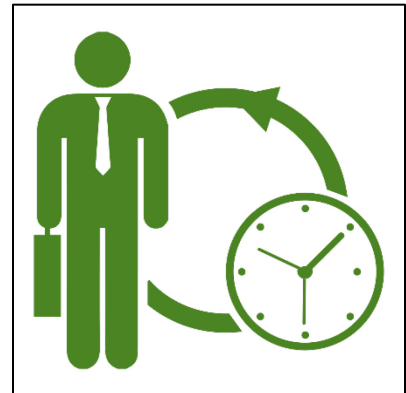


**Challenge 2:**

Some females and males have difficulties in private sector workplaces because they must work with the opposite gender. Design and conduct scientific research into this problem and a possible solution.

**Challenge 3:**

Private sector employers hire expatriate workers because of their work experience. Most Emirati students have no work experience when they graduate. Design and conduct scientific research into this problem and a possible solution.



**Challenge 4:**



Vision 2021 calls for Emiratis to learn from experts from around the world. When they begin their professional lives, some Emiratis have difficulties working with expatriates from different cultural backgrounds. Design and conduct scientific research into this problem and a possible solution.

## **Curriculum Vitae**

Karen Caldwell is a Canadian education developer who has lived, studied, and worked overseas in higher education since 1995. She has taught in Québec, Canada, South Korea, Turkey, the United Arab Emirates, and Bahrain, and has been a teaching assistant in the Johns Hopkins University (JHU) School of Education Doctor of Education (EdD) program. At JHU, she earned a two-year merit scholarship and has done EdD research as part of the Teaching as Research fellowship. Additionally, she has held leadership positions with the Embassy of Canada (Trade Commissioner of Education and Training and Regional Education Officer in the Arabian Gulf), University of Waterloo, Dubai Campus (Recruitment Manager and Outreach and Learning Services Manager), various Arabian Gulf higher education institutions (e.g., Director of Student Services, Curriculum and Assessment Developer, Manager of Administration), and the UAE Ministry of Higher Education and Scientific Research (Supervisor of Student Support and Professional Development). In her professional roles, she has traveled to Pakistan, Kuwait, Qatar, and Ghana to build bilateral relationships and establish outreach programs. The infographic below summarizes her professional experience, education, and training, and includes her website and social media links.

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