

The International Journal of HRD:

Practice Policy and Research

When to say ‘no’ to coaching assignments: a decision-making framework

David Clutterbuck,
Julie Haddock-Millar &
Sitira Williams

Evidence-based organizational change and development: is evidence-based OCD a reality or mere rhetoric?

Robert Hamlin, Jenni Jones &
Andrea Ellinger

Attraction of qualified people: digitalization as opportunity

Angélica Souza,
Marlene Amorim,
Marta Ferreira Dias,
Liliana Baptista & Rui Lopes

Cybersecurity simulations and training pedagogy: a pilot study of applied learning outcomes

Michael Workman

International perspective on mathematics teacher professional development: China case and implications for HRD

Jie Ke, Millard Juetta Bingham,
Rui Kang & Di Liu

Designing and implementing a distance programme for project managers in Ethiopia, Kenya and Uganda

David Smith, Sheila Vaughan,
Derek Eldridge & Lujia Feng



ABOUT IJHRDPPR

The International Journal of HRD Practice, Policy & Research is a new peer-reviewed journal which seeks to bring together international practitioner and academic expertise to promote and support the understanding and practice of Human Resource Development.

Much is discussed about bridging the academic practice divide. It is in many ways a false distinction but a challenge nonetheless. Critically, the International Journal of HRD Practice, Policy & Research seeks to approach this challenge from first and foremost a practice perspective. It is a practice centred journal which nonetheless provides the opportunity to synergise practice with theory to develop further insights to inform both disciplines. It offers the critically reflective professional practitioner insight, ideas and understanding on the contemporary issues and challenges facing HRD, its impact and influence. The types of contribution sought are described in more detail in the Contributor Guidelines on our website. Interested contributors are welcome to contact any of the Editorial Board to discuss their ideas.

The journal is sponsored by a partnership between the European Association of People

Management, the University Forum for Human Resource Development (UFHRD) and the World Federation of People Management Associations. The European Association for People Management (EAPM) was founded in 1962. The Association forms an umbrella body of national organisations which represent HR professionals.. It is an experience exchange organisation without profit-related objectives. The EAPM has, in total, 36 members from 36 European countries. Formed in 1999 the UFHRD is an international association for universities, reflective practitioners, and learning oriented organisations. The Forum's mission is to create, develop and inform leading-edge HRD theories and practices by promoting professionally-focused qualifications, co-operative research initiatives and consultancy interventions. The WFPMA is a global network of professionals in people management. It was founded in 1976 to aid the development and improve the effectiveness of professional people management all over the world. Its members are predominantly the continental federations which are made up of more than 90 national human resource associations representing over 660,000 people management professionals.



The journal is sponsored by a partnership between the World Federation of People Management Association (WFPMA), the University Forum for Human Resource Development (UFHRD) and the European Association of People Management (EAPM).

CONTENTS

From the editors

Pages 3 - 4

When to say 'no' to coaching assignments: a decision-making framework

David Clutterbuck, Julie Haddock-Millar & Sitira Williams

Pages 5 - 14

Evidence-based organizational change and development: is evidence-based OCD a reality or mere rhetoric?

Robert Hamlin, Jenni Jones & Andrea Ellinger

Pages 15 - 22

International perspective on mathematics teacher professional development:

China case and implications for HRD

Jie Ke, Millard Julette Bingham, Rui Kang & Di Liu

Pages 23 - 42

Cybersecurity simulations and training pedagogy: a pilot study of applied learning outcomes

Michael Workman

Pages 43 - 50

Attraction of qualified people: digitalization as opportunity

Angélica Souza, Marlene Amorim, Marta Ferreira Dias, Liliana Baptista & Rui Lopes

Pages 51 - 59

Designing and implementing a distance programme for project managers in Ethiopia, Kenya and Uganda

David Smith, Sheila Vaughan, Derek Eldridge & Lujia Feng

Pages 60 - 70

From the editors

Like many, the Journal of International of Human Resource Development: Practice, Policy and Research ('the journal') has had a challenging year. Changes to the journal that were planned to take place in 2020 were delayed. Nonetheless, we have made some progress. The journal is excited to be working with our new sponsors the World Federation People of Management Association (WFPMA) and European Association for People Management (EAPM), in addition to the University Forum for Human Resource Development (UFHRD), who remains the critical academic partner. As part of the change, we are growing our new editorial team and editorial advisory board.

We aspire to be the practitioners' go-to journal in people development and management. Building on its original ethos, the journal is for and by practitioners and policymakers, and strongly complemented by academia. The journal seeks to be truly international in terms of its readership and contributors. The journal provides a platform for cutting edge scholarly practice and research to be shared amongst people management professionals, general managers, and policy analysts. We publish on topics within the broad field of human resource development and education, and other adjacent areas such as employee relations and human resource management.

We have expanded the type of papers we publish, including conceptual articles, critical reflections, evaluations, literature reviews, provocations and traditional research papers. We have made the paper requirements more practitioner-friendly. Please visit our website for more information: www.ijhrdppr.com/contributor-guidelines. You may have also noticed that we have changed the 'look-and-feel' of the journal. We see these changes as evolutionary as we aim to keep ourselves ahead of other practitioner-orientated scholarly journals.

In this issue, we bring you six exciting articles. First, Clutterbuck, Haddock-Millar and Williams adopt a critical approach in their article to guide professional coaching practitioners. Their paper provides insight into factors that influence practitioners' decision in taking up coaching assignments. Second, Hamlin, Jones and Ellinger offer a significant practical 'reality' of evidence-based organizational change and development (EBOCD). Building on the work of EBOCD practice of over 70 evidence-based organizational leaders/managers, HRD professionals and change management consultants, they synthesise and offer practitioners several useful recommendations in enacting change.

Third, Ke, Bingham, Kang and Liu discuss teaching professionals of science, technology, engineering and mathematics (STEM) subjects in China. They found that

teachers preferred constructivist learning over traditional learning and nurtured students' self-regulated learning. However, they also discovered that teachers' support for social learning was low. The study also revealed that teachers' conceptions of their own learning were correlated with students' learning. Fourth, Workman explores educational technologies that enable real-world problems to be modelled in simulations in academic curricula. He conducted a traditional classroom/laboratory assessment and found that combining simulations with live activities in conjunction with classroom study produced the best outcomes.

Fifth, Souza, Amorim, Ferreira Dias, Baptista and Lopes examine the role human resource development in the context of 'place'. Their study offers novel insights into factors that attract the human capital needed for sustainable regional development and growth in medium-density urban regions, using the Aveiro region in Portugal as an example. Last but not least, Smith, Vaughan, Eldridge and Feng investigate an innovative distance learning programme in response to an international donor's request to improve project outcomes in its partner agencies in Ethiopia, Kenya, and Uganda. The programme's focus was on improving the skills of personnel working directly with poor communities across a range of project areas. The programme also intended to encourage sustainable processes of improvement through individual and group learning and positively impact the agencies' planning and implementation capacities.

We hope you enjoy reading the articles as much as we have.

Looking forward, we recently announced a call for papers to be published in a Special Issue on the impact of the Covid19 pandemic from the perspective of Human Resource Development and Management. The effects of Covid19 is unprecedented in terms of the scale around the world and its reach in all aspects of life. While the priority is to minimise mortality and ill health by ensuring people are protected from the virus, the economic and organisational impact, directly and indirectly, due to the pandemic has been equally immense. We seek various papers that include; conceptual papers, critical reflections/ auto-ethnographies, evaluations, literature reviews, provocations and research papers (including case studies) from any part of the world and any sector/ industry. Topics may include but not limited to;

1. How has Covid19 and resulting government measures impacted organizations at present, and how can organizations prepare for the future?
2. How do organizational actions compare across borders

for firms within a sector/ industry?

3. What are the critical priorities for human resource development/ management professionals supporting both the firm and staff through the pandemic?
 4. How has the pandemic impacted staff in terms of their wellbeing, engagement and development?
 5. What government interventions are needed to ensure that the impact on the labour market and workforce is minimised?
 6. How can public policies be designed to promote the adaptation and skills development of the employees to the new work context in times of a pandemic?
 7. How are leaders responding to the constraints of remote work?
 8. How will firms approach workforce planning and development in responding to new challenges regarding safety in the workplace?
 9. How can organizations reimagine the role of human resource development and management in times of pandemic and post-pandemic?
 10. What are the new work models and the role of technology, and its impacts on workforce performance?
- The topics in relation to the pandemic are almost limitless as we welcome different perspectives (e.g. micro to macro, employer and employee, diversity and inclusion). Papers can be between 3000 to 7000 words. Manuscripts should

be sent to IJHRDPPR@gmail.com. Although there was an initial deadline at the end of January 2021, due to requests from prospective contributors, we will extend the deadline to 19 July 2021. Nonetheless, please submit your manuscripts as soon as they are ready as we can publish the Special Issue in two parts to cater for manuscripts that have been accepted.

We welcome a conversation with you if you are interested in joining our editorial team or the editorial advisory board, or if you have a question about the Special Issue involving Covid19. Please contact us at IJHRDPPR@gmail.com.

Thank you, take care and stay safe.



Dr Mark Loon
Joint Editor-in-Chief
IJHRD



Dr Maria Jose Sousa
Joint Editor-in-Chief
IJHRD



When to say ‘no’ to coaching assignments: a decision-making framework

David Clutterbuck, Julie Haddock-Millar & Sitira Williams

Abstract

This paper presents a coaching assignment decision-making framework to assist coaches, and others in related to roles, to evaluate and make an informed choice about whether or not to accept a coaching assignment. There are good reasons to say ‘no’ to a coaching assignment, and a failure to do so can exact a serious cost – psychosocial, career-related or both. This paper presents empirical data, addressing the consequences of saying ‘yes’ when ‘no’ would have been the best decision in the circumstances, and presents a series of questions to inform the pre-coaching assignment decision-making process. The empirical data consists of a short survey completed by 345 experienced coaches. The data was subsequently analysed using NVivo in order to identify themes and illustrative responses, as well as summarizing and synthesizing the data as a whole. The findings explore the circumstances and factors respondents take into account when considering a coaching assignment. The authors present a coaching assignment decision-making framework. We hope that practitioners engaged in coaching may be able to benefit from the approach through the application of a practical framework and series of questions designed to be sufficiently flexible to apply to different contextual settings and circumstances.

Introduction

Practitioner and academic studies predominantly focus on the coaching approach, coaching process and/or the impact of coaching on the coachee (Wageman, Nunes, Burruss & Hackman, 2008; Chin-Yun, Long-Sheng, Ing-Chuang & Kuo-Chin, 2010). The quality of the relationship between the coach, the client and key stakeholders is believed to be one of the most critical indicators of coaching effectiveness (Baron & Morin, 2009; Bluckert, 2005; de Haan, Duckworth, Birch & Jones, 2013) and, ‘the more you and your client can include the whole system, the more effective the coaching is likely to be’ (Rogers, 2008, p. 123). Despite the known importance and value placed on the quality of

the relationship, few studies focus on the decision-making process and questions posed by the coach - in any role or context - to assist in the pre-coaching assignment phase, or as commonly known, the contracting phase which helps to steer and determine the quality of the relationship. Furthermore, the role of multi-stakeholder contracting is an area of growing importance as coaches find themselves working for multiple clients, where little guidance in the pre-assignment phase is currently provided in practitioner or academic studies. Against this backdrop, the authors aim to address the paucity of practice-based coaching studies in this area, presenting a coaching assignment decision-making framework, to assist coaches in any role, context or multi-party arrangement, to evaluate and make an informed choice about whether or not to accept a coaching assignment. The impetus for this paper is two-fold. First, the cause of saying ‘yes’ to a coaching assignment when the answer should be ‘no’ can be largely attributed to the absence of a thorough exploration and contracting phase.



Second, to address this need, we provide a multifaceted decision-making framework which addresses the challenges identified and enables coaches to thoroughly evaluate the coaching assignment. It is hoped that by enabling a multifaceted, informed choice, coaches will embark on coaching assignments which create and sustain an effective coaching relationship for all concerned. Our feedback so far suggests that it is a truly generic framework, applicable in all the coaching situations and contexts. Our decision-making framework is based on empirical data and over 40 years of coaching dialogue with clients, as the first two authors are Master and Senior Practitioner accredited coaches and mentors with the European Mentoring and Coaching Council. In presenting the framework, we hope that practitioners engaged in coaching may be able to benefit from the approach through the application of a practical framework and series of questions designed to be sufficiently flexible to apply to different contextual settings and circumstances. Our intention is to test the framework

approach. before commencing any coaching assignment, there is a period of exploration and contracting. The importance of the early phase in any coaching assignment cannot be under-estimated, indeed, arguably the most common cause of problems coaches bring to supervision is mismatch of expectations at the contracting stage of the relationship (Clutterbuck & Turner, 2019).

In the exploration – sometimes referred to as discovery - and contracting phase, the coach seeks to understand if the coaching assignment, client, third, and fourth parties are the right ‘fit’. Typically, in the contracting phase there are three main objectives: first, get a sense of direction and purpose for the assignment; second, to ensure that expectations are aligned (outcomes, process, responsibilities, behaviours); and three, to provide a practical basis for relationship review and assessment of progress. Additionally, the coach will want to consider aspects such as logistics, confidentiality and so on. In the situation where the coach may work with a client contracted by the client’s

In the situation, where the coach may work with a client contracted by the client’s organization, a three-way conversation between coach, client, and client’s boss (sometimes a four-way event, with Human Resources also attending) is crucial and is a vital part of the coaching process.

more widely over time, conducting a further study to analyse coaches’ experience of working with and adapting the framework as the next stage of our research.

The paper is structured as follows: the first section addresses the importance of the pre-assignment exploration and contracting phase in coaching assignments; next we outline the methodology, survey questions and sample size. The following section presents the key themes derived from the analysis of the data, including the respondents’ challenges in saying no to coaching assignments and the consequences that may follow. We then outline a coaching assignment decision-making framework. The final section summarizes key themes and implications for coaching and Human Resource Development practitioners.

Exploration, discovery and contracting

There are numerous approaches to coaching; external coaches that work with individuals (McCarthy & Milner, 2013); external team coaches that go into organizations to coach teams (Peters & Carr, 2013) internal coaches coaching employees, who are not their direct reports; and the coaching manager, or the team manager/leader acting as the team’s coach (Clutterbuck, 2010; Hawkins & Smith, 2006; Peters & Carr, 2013). Regardless of the coaching

organization, a three-way conversation between coach, client, and client’s boss (sometimes a four-way event, with Human Resources also attending) is crucial and is a vital part of the coaching process. The conversation will usually start with clarifying the purpose and importance of contracting, as the basis for clarifying the contract itself. Incorporating three components - psychological, outcomes-focused and systemic – the focus on each component is necessary. The psychological contract is essentially about inputs, relationships, and the environment in which the coaching takes place. The outcomes contract addresses a package of issues relating to intended and unforeseen outcomes from coaching. The systems contract encourages all parties to take a wider perspective, recognizing that success depends upon engaging with the key influencing systems as much as upon the efforts of coach and client. This is particularly important within the context of multi-stakeholder contracting; multiple parties associated with the coaching assignment and may influence the psychological, outcomes and systems contract. Turner and Hawkins (2016) international study of 651 coaches, coachees, and organizations who employ coaches, focused on the role of multi-stakeholder contracting where other stakeholders, in addition to the client, contribute to the formation and setting of outcomes. Multi-stakeholder contracting is identified as both essential to the success of a coaching

assignment and challenging. The challenges are often associated with boundary management, confidentiality, developing and agreeing outcomes. Fundamental to multi-stakeholder contracting is alignment between the stakeholders which enables shared understanding and expectations. The exploration and contracting phase is equally as important, if not more so, in multi-stakeholder coaching assignments.

Methodology

Between March and June 2019, the lead author distributed a short anonymous online survey to experienced coaches through his LinkedIn coaching network. The LinkedIn coaching network group largely consists of experienced, accredited coaches. The majority of coaches are accredited through the European Mentoring and Coaching Council and/or International Coach Federation. The response rate was high; 345 practicing coaches completed the survey. The survey questions were as follows:

1. Have you ever regretted taking on a coaching assignment, feeling that you should have turned the assignment down?
2. What did you learn from the experience?
3. As your coaching practice has developed, what has changed for you in how you decide to take or refuse an assignment?
4. What criteria do you use to decide whether you are the right coach for a potential client?
5. What are the top three right reasons for accepting an assignment?
6. What are the top three wrong reasons for accepting an assignment?

approach yielded interesting and rich results. Over two-thirds of respondents (77%) regretted taking on coaching assignments at some point in their coaching career. Those that did regret taking on coaching assignments cited a variety of reasons; the overriding reason was not paying attention to their intuition, instinct or 'listening to the gut'. Other themes included the three-way or four-way conversation and relationship between the organization, HR department, line manager, coachee, and coach; the organization's requirement for the individual to be coached rather than the coachee desiring to be coached; an eagerness to accept coaching assignments to build coaching practice and professional brand rather than choosing the 'right' assignment; money featuring too highly on the agenda and the cost not reflecting the service offered; the need for alternative support such as counselling and psychological support; a clash in ethical perceptions. The degree of self-insight is important in this regard, analysing our own coaching practice, values, and expectations will underpin any coaching assignment decision.

External coaches who work with individuals in the organizational setting are frequently commissioned by the HR department, a more senior manager or line manager, rather than by the individual receiving the coaching. In this circumstance, there are multiple stakeholders, dynamics, and potentially expectations to take into account when considering the coaching assignment. For the inexperienced coach, this can be difficult territory to navigate, not least because of the number of stakeholders, relationship dynamics, and expectations to consider. For those coaches engaged in a tri-party or four-party coaching assignment, this was one of the greatest areas of learning.

Analysing our own coaching practice, values, and expectations will underpin any coaching assignment decision.

As the primary aim of the research was to build a coaching assignment decision-making framework, the overriding purpose of the data collection tool was not to focus solely on statistics and frequencies but rather on the insights and rationale provided by the respondents in relation to each question. The authors used NVivo to analyse the data; all responses to all questions were coded and nodes were identified. The nodes represent themes and allow for the frequency of themes to be recorded. Quotations which illustrated each node and theme were highlighted. An analysis summary comprised a 26-page document with themes, frequency of references, quotations, weighted percentages, and word counts. The following section presents the data analysis.

Results

Respondents were able to consider their developing and evolving coaching practice, enabling self-reflection and sharing the personal insights into their practice. This

Respondents explained:

- I learnt I needed to establish the buyers' expectations and establish boundaries for what I could and could not offer.
- This was many years ago but I learned about the importance of contracting with both sponsors and coaches to align agendas and assess the commitment of both to the coaching process.
- Be very clear at the contracting stage and set the expectations of the third party; I should have contracted more clearly, because I felt intimidated, I didn't reconstruct or even share enough of my observations.

Self-insight, stakeholder analysis, and alignment are key aspects of the pre-coaching assignment phase. Coaches need to have a clear understanding of their values and what they believe to be important in a coaching assignment. This is coupled with clarity concerning the parties involved in the coaching assignment, their needs, expectations, and the

working parameters and dynamics. These considerations were reflected in the responses above.

As a newly qualified coach there is an inherent eagerness to search for, and accept, coaching assignments in order to build a portfolio of clients and successful coaching practice. However, the eagerness and desire and to accept coaching assignments can cloud judgement and result in the overlooking of potential issues or concerns which may be flagged up in the pre-coaching assignment exploration or discovery phase. In addition, the need to create a source of income can also cloud judgement; as coaches develop their experience and practice, the financial consideration becomes clearer. Whilst it is important to earn a fee which is a fair exchange, it is not the deciding factor. Respondents explained:

- I also learnt how taking the coaching assignment was more for adding the brand to my profile versus really coaching.
- The money offered by the client should not be the only factor determining whether to take on the coaching assignment or not.
- I learned that good money does not replace good sleep. I always want to know that my choices have been integral at the end of the day.

Other reasons for regretting taking on a coaching assignment and lessons learned included an ethical clash and/or the client's need for alternative support. This is illustrated by the following responses:

- This was a woman who was raised with significant trauma: race, poverty, violence within the family ... I was working over Zoom. After four sessions it was clear that it was not working for her or me. I hope she sought a therapist to work in person with her.
- I knew I should turn down the client because of it's not my speciality to work with substance abuse. Prospective clients sometimes hide conditions such as alcoholism, attention deficit hyperactivity disorder, attention deficit disorder.

When asked to identify the top three right reasons and top three wrong reasons for accepting a coaching assignment, three clear themes emerged from each category (see Table 1).

Coaches are keen to work with clients who are authentic, genuine, engaged, motivated, and curious; therefore, the client's behaviour and attitude was cited by nearly half

of the respondents (45%). In a discovery meeting and contracting phase, taking the time to understand the kind of personal attributes and traits the client exhibits can help determine the degree of fit between the coach and the client. Indeed, degree of fit between the coach and client was a deciding factor for 27.5% of respondents. Many, if not all, coaches, place a significant emphasis on the level of rapport felt in the pre-assignment phase and the early stage of the coaching relationship. As strong rapport builds trust, honesty, and openness, it is viewed as central component to any successful coaching relationship. In addition, the degree of confidence in their own abilities is an important factor when choosing to accept a coaching assignment. Many coaches want to feel confident that they will be able to add value and make a difference. This is illustrated by the following respondents:

- Do I as a coach feel I can help move the clients towards their desired outcome – whilst I am not an expert or giving advice, I need to feel comfortable that it's an area [where] I believe I can help the client and it's not more appropriate for a different type of intervention.
- That I have the level of knowledge and experience to support the client effectively in what they would like to achieve.

Reflecting on the wrong reasons for accepting a coaching assignment, money was cited by over two-thirds of respondents (70%). Remuneration is an important aspect for any professional as it is inextricably linked to value and self-worth; however, it should not be the sole reason for accepting a coaching assignment. One respondent explained:

'Money, but I don't mean that simply. Being paid as a professional is important to me, and underpins the value perceived by the client of the work. However, I don't recommend coaching just because someone is paying.'

Often, coaches are under pressure to accept a coaching assignment either by the organization contracting the coaching services or by the coachee. On occasion, coaches can feel desperate to take on new clients, often associated with finances but also accreditation and credentialing, ego and reputation. Respondents explained:

- Commercial pressures; they will get what coaching is as we go through it; the buyer of the coaching will be disappointed, if I say no.
- Feeling for some reason, I do not have a choice and am

Table 1

Right and wrong reasons for accepting a coaching assignment

Accepting a coaching assignment			
Right reasons		Wrong reasons	
Clients' behaviour and attitude	(45%; n=155)	Pay	(70%; n=231)
Coaches' faith in their own abilities	(33%; n=115)	Pleasing the client/ buyer	(36%; n=123)
Fit between coach and client	(27.5%; n=95)	Desperation for clients	(18.5%; n=64)

doing it for someone other than the client.

- I want to pile up the hours for credentialing; add a name of the company to your client list; you are going through a slow period; I want to grow my business so I will coach anyone.

Weighing up the pros and cons of the coaching assignment enables the coach to think clearly about the benefits and costs associated with the coaching assignment, including areas such as remuneration, satisfaction, and the degree to which the coach feels able to add value. Over a number of years, many of the responding coaches have developed their own criteria for deciding whether they accept a potential client. The frequency analysis of the responses shows that the top three themes included the client's ability to be coached (24%), the match between the client's needs and the coaches' skills and expertise (22%) and, the chemistry between the coach and client (21%). Some respondents (15%) would frequently use a discovery session to explore the degree of 'fit' between the coach and client. The client's ability to be coached is influenced by a range of factors including their willingness to trust and disclose, openness, commitment, and readiness to explore and experiment. It is also important to explore if coaching is the 'right' developmental intervention. This is illustrated by the following respondent quote:

'My first assessment is to whether it is really is coaching that the client is looking for, rather than consulting or mentorship, or whether a different intervention is warranted such as counselling or psychotherapy.'

Coaches often have a specialist area - for example life coaching, executive coaching, or resilience coaching. In this situation, finding the right fit for their skill set is important. Respondents explained: 'Does the client fit my area of interest and expertise?; fit between clients felt needs and my coaching capabilities; if I have the right set of skills and competencies'. For some respondents, it is the combination of factors that help them decide on whether or not to accept a potential client. For example, one respondent explained: 'I look for a match of needs, skill set and, most of all, personality'.

As respondents' coaching practice has developed over time, they have become more mindful and considered in their selection of client and the robustness of the contracting stage of the coaching assignment has advanced. Coupled with this, their degree of self-insight has developed and the ability to listen to their inner voice. Therefore, the most significant changes cited by the respondents included the greater awareness of what the coach can offer, finding the 'right fit', transparency around the contracting process and the courage to challenge even in the contracting stage. The aforementioned themes are illustrated by the following respondent comments:

- Everyone is coachable, but not by me. Determine the coach's interest, determination, and commitment to change. Know if they are volunteering or assigned to coaching. Does the employer and/or coachee see the engagement as corrective or punishment?
- I feel that my contracting process has developed over

the years to cope with most situations I may encounter, including termination.

- Clarify the needs better, be courageous enough to call out ambiguity and its likely consequences ... if the contract seems less than transparent or unethical, it is never good to proceed.
- Ask more questions of potential clients and give them a questionnaire or other sort of homework before the first consultation. If they don't do it, I'm not going to have the first meeting!

Overall there was a high degree of divergence between the criteria used by coaches to decide whether they are the right coach for a potential client and the right and wrong reasons for accepting an assignment. The responses show that the degree of self-insight, including the ability to analyse coaching practice, values, and expectations is an important starting point in the pre-assignment phase. This is followed by the analysis of stakeholder needs and the degree of alignment between the coach, client, and stakeholder expectations. Rapport is regarded as an essential element within the pre-assignment phase and early stage of the coaching relationship. Weighing up the pros and cons of the coaching assignment, whilst also listening to intuition and aligning the two – or not - may help to move discussions forward and, finally, confirming the contract which will set out key aspects such as expectations, terms, conditions, and logistics. In the next section, we provide a seven-stage decision-making framework which can help to guide the process and ultimately reach the best decision for all involved in the coaching assignment.

A decision-making framework for coaching assignments

The seven-stage decision-making framework (see Figure 1) is informed by existing literature search, the authors' many years of experience in the fields of coaching, mentoring and team coaching and the results of this empirical study. Our feedback so far suggests that it is a truly generic framework, applicable in all the coaching situations and contexts against which we have been able to test it. However, to be sure that this is the case, the framework needs to be tested more widely over time. It is our intention to conduct a further study, analysing coaches' experience of working with and adapting the framework as the next stage of our research.

We offer here some key questions for each element, with a fuller list for further consideration in the Appendix.

Self-insight: analysing your own coaching practice, values and expectations

Having a clear understanding of your own coaching practice, values, and expectations will underpin any coaching assignment decision you make. All coaches have their own unique set of values that they believe to be important. Decisions are often based on values. Questions might include:

- What are the areas you feel most and least comfortable in supporting in a coaching assignment?
- What is the ethical basis of your coaching practice? How clearly can you articulate this to yourself, to clients and their stakeholders?
- What is important to you in a coaching relationship?

Information gathering: analysing needs and expectations of the client and stakeholders

Gaining clarity on the parties involved in the coaching assignment, their needs, expectations, and the working parameters and dynamics are important aspects to consider. Questions might include:

- What makes them think that coaching is a suitable intervention for this issue at this time?
- What is the sponsor’s strategy for ensuring the coachee gets the support they need?
- How will stakeholders respond to changes in the client’s goals from coaching as the coaching conversations bring about shifts in self-awareness and situational awareness?

Alignment between stakeholders: analysing the degree of alignment between coach, client, and stakeholder needs and expectations

Reflecting on the degree of alignment of expectations between all the stakeholders, including the coach, can identify areas of discomfort. Questions might include:

- Who genuinely wants the client to succeed?
- How do the intended outcomes of the coaching assignment align with my values, the client’s values, and the organization’s espoused values?
- How aligned are the expectations of the client and the sponsor?

Establishing rapport: exploring the degree of rapport or ‘chemistry’ between the coach and client

Many, if not all coaches, will place a high importance on the degree of rapport or ‘chemistry’ in the relationship,

as strong rapport builds trust, honesty, openness, and the willingness to experiment and take risks.

Questions might include:

- Are we able to be relaxed, open, and professional together?
- Do we share similar values?
- How willing is the client to be challenged?

The balance sheet: identifying and weighing up the pros and cons of the coaching assignment

One way of weighing up the pros and cons is to use a ‘balance sheet’, benefits and costs associated with the coaching assignment. Points to consider include:

- The degree of risk involved in the coaching assignment.
- Remuneration: do you feel sufficiently rewarded for what is being asked?

The inner voice: listening to your intuition

No matter what the pros and cons suggest and the ‘balance’ on a balance sheet, our inner voice - instinct, intuition, and ‘gut’ - is usually right. Listen to your inner voice, does it align to the outcome of your balance sheet? Questions might include:

- What does my experience in similar situations tell me?
- How do I view the need for coaching – is it being requested/used as a coping strategy, to avoid dealing with bigger or more difficult issues?

Making the decision: confirming the contract

You will have gathered all the information you need on which to base a decision, and you have weighed the pros and cons of each. You will want to confirm the contract which confirms expectations, terms, conditions, logistics etc. Aspects might include:

- Being explicit about areas of concern and writing these into the contract and agreeing what happens should any of the issues occur at any point in the

Table 2
Seven stage decision-making framework for coaching assignments

Seven-stage decision-making framework for coaching assignments		
1.	Self-insight	Analysing your own coaching practice, values, and expectations
2.	Stakeholder analysis	Analysing the needs and expectations of the client and stakeholders
3.	Stakeholder alignment	Analysing the degree of alignment between the coach, client, and stakeholder needs and expectations
4.	Establishing rapport	Exploring the degree of rapport – ‘chemistry’ – between the coach and client
5.	The balance sheet	Weighing up the pros and cons of the coaching assignment
6.	The inner voice	Listening to your intuition
7.	Confirmation	Confirming the contract

coaching assignment.

- Re-affirming the shared values that will underpin the contract and the various relationships.
- Having a clear contract with yourself that addresses your needs for self-care and protecting your reputation.

Summary and implications for practice

Considering how much individuals and organizations pay for the services of coaches, it might be expected that the relationship between them would be a partnership, aimed at providing the best possible support for the client and, where both the coach and client feel valued and all parties benefit. However, our empirical research shows that overwhelmingly, coaches frequently undertake coaching assignments which they later regret. In most cases, the issues may have been avoided with a multi-party, comprehensive, and authentic exploratory and contracting phase prior to agreeing the coaching assignment. Indeed, the cause of saying 'yes' when the coach should say 'no', can be largely attributed to the absence of a thorough exploratory and contracting phase, failing to listen to inner voice and accepting the coaching assignment for the wrong reasons. Typically, as coaches grow and develop their practice the issues around exploration and contracting tend to lessen as coaches develop their knowledge and expertise in this

phase of the coaching assignment, and build their own self-awareness and insight. However, this is not always the case and challenges around coaches' personal agenda and their inner voice repeatedly occur. Where an organization commissions the coaching assignment, it is important to position the coaching assignment as a multi-party relationship, in which coach, coachee, sponsor, and the client's line manager all have a significant role; and for which all have a sense of ownership. Undoubtedly, the quality of communication between all of these stakeholders underpins the effectiveness of the coaching assignment, in addition to agreeing and adhering to practical protocols which provide clarity and alignment of expectations and behaviours. To our knowledge, no coaching assignment decision-making framework exists which addresses self-insight, stakeholder analysis and alignment, establishing rapport, analysing the balance sheet, listening to the inner voice, and confirming the contract. We recognize that guidance exists around the individual elements we refer to, however our hope is that our multifaceted decision-making model can assist coaches in the exploratory and contracting phase of the coaching assignment, particularly where there may be numerous stakeholders with an interest in the assignment. Addressing some of the fundamental, subtle, and perplexing challenges prior to commencing the coaching assignment will undoubtedly improve the pre-coaching assignment phase and, ultimately, the effectiveness of the coaching relationship for all involved.



References

- Baron, L. and, & Morin, L. (2009). 'The coach-coachee relationship in executive coaching: A field study', *Human Resources Development Quarterly*, 20(1), pp.85-106.
- Bluckert, P. (2005). 'Critical factors in executive coaching – the coaching relationship', *Industrial & Commercial Training*, 37(6/7), pp.336-340.
- Chin-Yun, L., Long-Sheng, L., Ing-Chuang, H., & Kuo-Chin, L. (2010, November). Exploring the moderating effects of LMX quality and differentiation on the relationship between team coaching and team effectiveness. In 2010 International Conference on Management Science & Engineering 17th Annual Conference Proceedings (pp. 886-892). IEEE.
- Clutterbuck, D. (2010). Coaching reflection: the liberated coach. *Coaching: An International Journal of Theory, Research and Practice*, 3(1), 73-81.
- Clutterbuck, D., & Turner, E. (2019). All in the small print. A brief study of contracting issues in coaching and supervision. 15th Annual Coaching and Mentoring. Oxford Brookes University.
- de Haan, E., Duckworth, A., Birch, D., & Jones, C. (2013). 'Executive coaching outcome research: The contribution of common factors such as relationship, personality match and self-efficacy', *Consulting Psychology Journal: Practice and Research*, 65(1), pp.40-57
- Hawkins, P., & Smith, N. (2006). Coaching, mentoring & organizational consultancy. Maidenhead: McGraw-Hill.
- McCarthy, G., & Milner, J. (2013). Managerial coaching: challenges, opportunities and training. *Journal of Management Development*, 32(7), 768-779.
- Peters, J., & Carr, C. (2013). Team effectiveness and team coaching literature review. *Coaching: An International Journal of Theory, Research and Practice*, 6(2), 116-136.
- Rogers, J. (2008). *Coaching skills: A handbook: A handbook*. McGraw-Hill Education (UK).
- Turner, E., & Hawkins, P. (2016). Multi-stakeholder contracting in executive/business coaching: An analysis of practice and recommendations for gaining maximum value. *International Journal of Evidence Based Coaching and Mentoring*, 14(2), 48.
- Wageman, R., Nunes, D. A., Burruss, J. A., & Hackman, J. R. (2008). Senior leadership teams: What it takes to make them great. *Harvard Business Review Press*.

Appendix: Further questions for each element of the framework

Self-insight

- Are there any areas/topics/situations that are a clear no to a coaching assignment?
- How do you define your coaching practice?
- What are your core coaching strengths?
- What are your expectations in relation to your behaviour and the behaviour of your client and stakeholders pre, during, and post the coaching assignment?
- Where, how, and when are you willing to coach?
- What level of remuneration do you expect to receive for your coaching assignments and what might be an acceptable schedule of payments?

Information gathering

- What is their previous experience of coaching?
- What is the client's commitment to making the coaching assignment work?
- What is the line manager's and/ or sponsor's commitment to providing the required level of support? (What expectations do they have of their input?)
- Where does the responsibility lie for identifying issues, gathering feedback, giving feedback, and so on?
- What forces will work in support of the outcomes contract?
- What might get in the way?
- What are stakeholders (such as the client's boss) prepared to commit to?
- Who else's support is needed and how?
- What will be the location, length, and frequency of the sessions and how and on what basis contact is made between session?
- Is the contract on an open-ended basis or will a fixed number of sessions be determined at the outset? If open ended, what will be the frequency of review?
- What are the expectations around confidentiality and disclosure?
- What are the protocols about how to deal with issues such as conflict of interest or confidentiality?
- What is this organisation's history in terms of partnership with coaches?

Alignment between stakeholders

- Is the assignment genuinely developmental or is it really remedial?
- Are the agendas of all parties open and transparent?
- Does the client have a genuine need, for which they take ownership, or is this “vanity coaching” aimed at ticking the self-development box?

Establishing rapport

- Do I trust the client? Do they trust me?
- Do I trust the sponsor? Do they trust me?
- Do we have the same expectations about the coaching relationship?
- Is the relationship genuinely empowering for both of us?
- What is the level of psychological safety?
- What is the client’s capacity for an honest and self-honest learning dialogue?
- Are we too similar in personality and background to achieve a high level of positive challenge?
- What conscious or unconscious biases might affect my ability to be objective?
- Am I likely to be affected by the power dynamics of the relationship?
- Is “client envy” a potential risk in this relationship?
- Do I feel that the client’s goals are ones that I really want to help them with?

The balance sheet

- How honest am I being with myself about my motivations for taking on this assignment?
- Is my need to be helpful overshadowing concerns I have about this assignment?
- When I look back on this assignment in six months’ time, will I regret it?
- What are the costs (financial, reputational, and self-care) in taking versus not taking this assignment?

The inner voice

- What risks am I discounting because other factors overrule my concerns?
- What would the best coach I know (or me at my best) be thinking right now?
- Who should I talk to, who will be brutally honest with me?

Making the decision

- Ensuring that reviews of the assignment take place, where issues can be addressed before they become critical.
- Being prepared to walk away, at any stage, if the contract is seriously breached.
- What might go wrong in this relationship and what are my prevention strategies?

ABOUT THE AUTHORS



David Clutterbuck

Professor David Clutterbuck is a Special Ambassador, European Mentoring and Coaching Council (EMCC), he co-founded the EMCC in 1992. He developed the International Standards in Mentoring Programmes in Employment. David now actively promotes the International Standards in Mentoring and Coaching programmes. He has led hundreds of research and practice projects in coaching and mentoring over the past 40 years. David has authored over 70 books on coaching, mentoring, leadership and other management themes. David is a visiting professor in coaching and mentoring at Henley Business School (Reading University) Sheffield Hallam, Oxford Brookes and York St John Universities. David can be contacted at: david@davidclutterbuckpartnership.com

Julie Haddock-Millar

Julie Haddock-Millar is an Associate Professor of Human Resource Management and Development at Middlesex University Business School (MUBS). She is a Senior Fellow of the Higher Education Academy (HEA) and Chartered Member of the Chartered Institute of Personnel and Development (CIPD). She is the International Work Group Leader for the International Standards in Mentoring and Coaching Programmes (ISMCP) for the European Mentoring and Coaching Council (EMCC) and EMCC UK Professional Development Director (joint appointment). Julie is an accredited Senior Practitioner Coach and Mentor and Master Practitioner Coaching and Mentoring Programme Manager. Julie can be contacted at: j.haddock-millar@mdx.ac.uk



Sitira Williams

Sitira Williams is a PhD Doctoral Student at De Montfort University, Leicester. She is carrying out research on Social Value aspects and the role of Birth Parents and Carers' influence on the wellbeing of Transgender Children in the UK. She joined Middlesex University as a Research Associate specialising in data analysis in impact evaluation case study research. She has previously worked on research projects to assist in social sciences research into the area of sexual health, chronic illnesses, and infectious diseases. Sitira can be contacted at: sitira_williams@hotmail.co.uk

Evidence-based organizational change and development: is evidence-based OCD a reality or mere rhetoric?

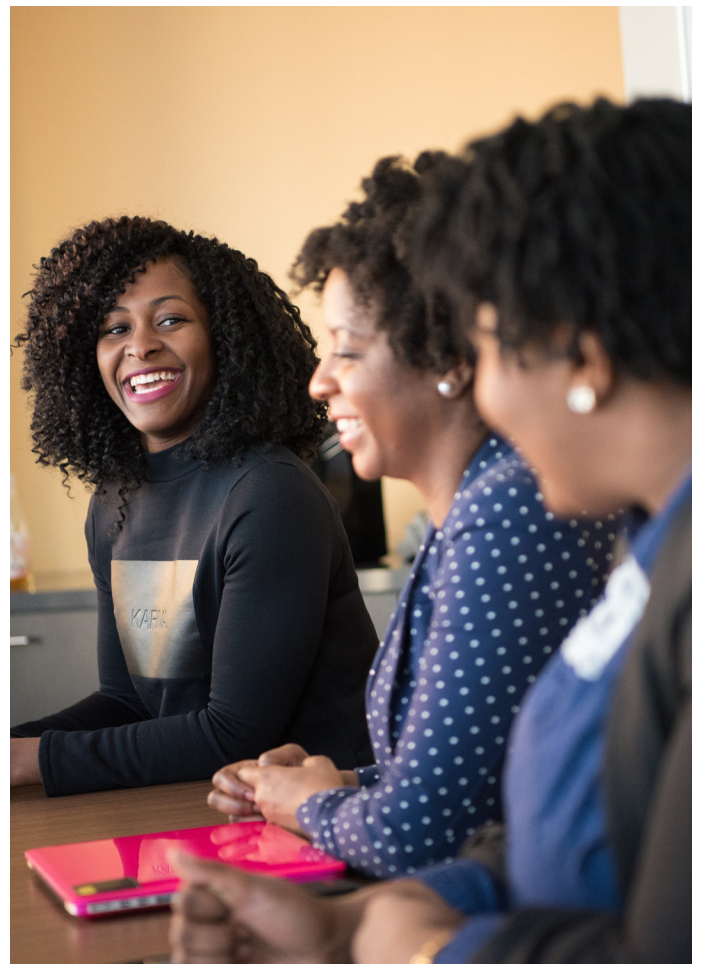
Robert Hamlin, Jenni Jones & Andrea Ellinger

Abstract

This article discusses the compelling need for, and demonstrates, the significant practical ‘reality’ of evidence-based organizational change and development (EBOCD). It offers a summary of a previously conducted analysis that resulted in 10 validated ‘original’ and 10 ‘new’ emergent common ‘insights’ and ‘lessons learned’ on the effective formulation and implementation of OCD initiatives. These were deduced from ‘critical perspectives’ and ‘reflective case histories’ of EBOCD practice offered by over 70 evidence-based organizational leaders/managers, HRD professionals and change management consultants. The article concludes with several recommendations for those engaged in OCD change agency practice.

Introduction

Organizational change and development (OCD) is a core component of modern-day human resource development (HRD). As Stewart (2015) claims, professional HRD practitioners are change-agents skilled in advising and helping leaders and managers with the facilitation of OCD programmes, either in their capacity as a colleague or as an external consultant. This resonates with Kohut and Roth’s (2015) argument that HRD practitioners should increasingly enter the fray of the discussion on change management; and with McKenzie, Garavan and Carbery’s (2012) observation that they are increasingly becoming strategic partners of managers tasked with aligning people,



strategy, and performance. It also resonates with Hamlin's (2019, p. 8) definition of HRD which asserts that:

Contemporary HRD is: the study or practice concerned with the diagnosis of performance-related behaviour change requirements at the individual, group and organizational level within any host entity, and the design, delivery, and evaluation of formal and/or informal activities to meet the identified needs (Copyright © r.g.hamlin, 2017)

However, as previously discussed by one of us in a previous issue of this Journal (see Hamlin, 2016a, p. 8), a major challenge confronting modern-day HRD practitioners is how best to help organizational leaders and managers facilitate and manage OCD programmes that continue to increase in frequency, pace, and complexity. Effectively addressing this challenge is an essential requirement bearing in mind that 70% or more of right-sizing, mergers, acquisitions, and other types of OCD programmes appear to either fail or just partially succeed, and workplace outcomes of so many OCD initiatives have a negative impact on employees (Burnes & Jackson, 2011; Carnall & Todnem By, 2014; Shook & Roth, 2011; ten Have, ten Have, Huijsmans & Otto, 2017). Sadly, as Stanford (2016) observes, although organizational leaders, line managers, talent management professionals, and other developers within organizations may realize the need for an OCD initiative, they often fail to grasp the complexity of what change management entails or to recognize that their expectations are not aligned with what is feasible. This is particularly so when they fail to take the time necessary to understand the scope of the change, the involved stakeholders, the complexity of the dynamics of the internal and external environments, and the impact of change from a systems perspective.

According to Hamlin (2001a & 2016b) there are five 'failings' of managers that contribute to this lack of competence and effectiveness in bringing about effective and beneficial OCD, namely: i) not knowing the fundamental principles of change agency practice; ii) succumbing to the temptation of the 'quick fix' or 'simple solution'; iii) not fully appreciating the significance of the leadership and cultural aspects of change; iv) not appreciating sufficiently the significance of the people issues, and v) not knowing

the critical contribution that the HRD function can make to the management of change. He also argues that these failings are exacerbated by the lack of credibility that so many trainers and developers (HRD practitioners) have in the eyes of managers. Hamlin (2016b) argues that one of the best ways forward for managers and HRD practitioners is for them to become evidence-based in their change agency practices. He defines evidence-based OCD as follows:

Evidence-Based OCD is: the conscientious, explicit and judicious use of current best evidence and/or of action research to inform, shape, critically reflect upon, and iteratively revise decisions made in relation to the formulation and implementation of OCD interventions and the associated change management processes (p. 129).

His advocacy of evidence-based OCD is consistent with the 'rhetoric' of numerous scholars who argue the merits of 'evidence-based human resource development' (see Gubbins, Harney, van der Werff & Rousseau, 2018; Holton, 2004; Kearns, 2014) and of 'evidence-based management' (see Axelsson, 1998; Brewerton & Millward, 2001; Briner, Denyer & Rousseau, 2009; Latham, 2009; Pfeffer & Sutton, 2006; Rousseau, 2012; Stewart, 1998).

A major challenge confronting modern-day HRD practitioners is how best to help organizational leaders and managers facilitate and manage OCD programmes that continue to increase in frequency, pace, and complexity.

Demonstrating the 'reality' of evidence-based OCD

In support of his long-standing advocacy of evidence-based OCD, Hamlin has sought over the past 20 years to demonstrate its 'reality' in the world of practice. This has been in the form of obtained 'stories' told in the candid and authentic voices of numerous organizational leaders, line managers, HRD practitioners, OCD specialists, executive coaches, management consultants, and other professional organizational change agents who have been successful in bringing about effective and beneficial OCD. A set of such stories based on OCD-related initiatives carried out during the 1990s in 16 British public, private, and third (not-for-profit) sector organizations, and also in an Irish private company and a Dutch public sector organization, was published in *Organizational Change and Development: A Reflective Guide for Managers, Trainers and Developers*

(Hamlin, Keep & Ash, 2001). A more contemporary set of 33 equivalent multi-sectoral stories of evidence-based OCD change agency, which Hamlin refers to as ‘critical reflective case histories,’ and of which 18 were carried out in ‘Anglo’ countries (New Zealand, UK, USA) and 15 in ‘Non-Anglo’ countries (Germany, Honduras, India, Italy, Lebanon, Malaysia [though linked to Australia], the Netherlands, Portugal, Singapore, Switzerland,

United Arab Emirates), was recently published by IGI Global Publishers in a two-volume book -Evidence-Based Initiatives for Organizational Change and Development (Hamlin, Ellinger & Jones, 2019).

Underpinning all of these ‘critical reflective case histories’ (CHs) was the recognition by the respective OCD practitioner authors that adopting an ‘evidence-based practice’ (EBP) approach to change agency practice

Table 1.

Framework of ‘original’ common insights/lessons (CILs) about effective OCD change agency and empirical support/validation from the Hamlin, Ellinger and Jones (2019) study

1. Communicating with all stakeholders for the purpose of securing common ownership, commitment and involvement (27 of 33: 81.82%)
2. Securing the active commitment, involvement and participation of senior to middle managers is pivotal (24 of 33: 72.73%)
3. Securing top management support. (16 of 33: 48.48%)
4. Being clear, consistent and open with regard to what you are seeking to achieve, setting clear strategic objectives, and sharing the vision (18 of 33: 54.55%)
5. Recognising and addressing the real problems or root causes of change agency problems, including the cultural dimensions (13 of 33: 39.39%)
6. Giving enough time for the OCD programme to take root and succeed (21 of 33: 63.64%)
7. Recognising the relevant contributions that the HR function can make and the strategic role it can play in bringing about transformational change. (6 of 33: 18.18%)
8. The role of learning in the change management process and the need for a no-blame culture (18 of 33: 54.55%)
9. The importance of being reflective as a change agent (22 of 33: 66.67%)
10. The value of conducting internal research as part of the change agency practice (24 of 33: 72.73%)

Note: The insights/lessons in italics relate specifically to evidence-based OCD initiatives

Source: Hamlin, Ellinger and Jones (2019)



requires change leaders and change agents to take all necessary actions to:

- Understand and make sense of the organization and what is going on;
- Formulate appropriate well-informed change strategies by reference to relevant theories, models, and empirical research;
- Implement these strategies effectively and efficiently;
- Evaluate critically the effectiveness of the change processes; and,
- Reflect critically upon their own professional practice to draw useful insights and learn lessons for the future.

By adopting an EBP approach, Hamlin et al. (2019) argue it is likely the OCD strategies of change agents will be more effective than when they use other approaches. To meet the challenge of the necessary actions outlined above, they need increasingly to draw upon different forms of best evidence to help inform, shape, and critically evaluate their change agency practice. The forms of best evidence can include: i) Mode 1 ‘scientific research’ which is concerned with conceptual knowledge production and the testing of theory; ii) Mode 2 ‘applied research’ which is mainly

concerned with instrumental knowledge production to solve real-life problems; lesser strength best evidence including: iii) ‘descriptive studies and/or self-report stories’ and ‘the opinion of respected authorities or expert committees’; and, iv) ‘situated expertise’ based on the proficiency and judgment that individual OCD practitioners acquire through experience and practice (see Morell, 2008; Reay, Berta, & Kohn, 2009; Rynes & Bartunek, 2017; Tourish, 2013).

By reviewing and critically reflecting upon their own ‘situated expertise’ in facilitating and managing OCD, new ‘insights’ and ‘lessons’ (ILs) can be gained/learned as to why particular initiatives succeed or fail in specific organizational contexts, and about effective and ineffective OCD change agency practice. Furthermore, by comparing and contrasting the ILs resulting from the ‘reflections on practice’ of various OCD practitioners who have gained ‘situated expertise’ in single or multiple organizations in different organizational sectors and countries, common ‘insights’ and ‘learnt lessons’ (CILs) about effective and ineffective OCD practice are likely to be identified. As part of Hamlin’s (2001b) chapter Towards research-based organizational change and development (Chapter 11) that he contributed to the Hamlin, Keep and Ash (2001)

Table 2

Emergent ‘new’ common insights and lessons (CILs) and proportion of the 33 ‘critical reflective case histories’ from which they are derived

1. Create a vision and set of values that engage everyone	27.27% (n=9)
2. Allow participative ‘bottom up’ initiatives in the change process	24.24% (n=8)
3. Adopt a shared/distributive leadership approach	12.12% (n=4)
4. Engage participants affected by the change by giving them voice, using their expertise, involving them, and treating them as active collaborative partners	27.27% (n=9)
5. Recognize the power of trust and build on it	9.10% (n=3)
6. Use theory and models as change agency tools, and draw upon sources of ‘best evidence’ to inform and guide OCD processes	63.64% (n=21)
7. Ensure understanding of individuals’ interests and the power relationship between those involved in the change, and also respect their perspectives	24.24% (n=8)
8. Ensure collaboration between internal external (or internal) change consultants and the internal client change agents	12.12% (n=4)
9. Ensure all change agents involved in the OCD processes become fully skilled and act as a team	24.24% (n=8)
10. Ensure the ‘soft’ social/interpersonal relations/cultural aspects	18.18% (n=6)

Source: Hamlin, Ellinger and Jones (2019)

Table 3

Number of Anglo and Non-Anglo case histories (CHs) citing references drawn from each type of OCD-related ‘best evidence’ publications

	Type A ‘Best Evidence’ Publications	Type B ‘Best Evidence’ Publications	Type C ‘Best Evidence’ Publications	Type D ‘Best Evidence’ Publications
Anglo Case Histories	17	13	11	8
Non-Anglo Case Histories	14	10	10	8
	31 (93.94%)	23 (69.70%)	21 (63.64%)	16 (48.48%)

book, he conducted a ‘multiple cross-case comparative analysis’ (MCCCA) of the 16 contributed ‘stories’ of research-informed/evidence-based OCD. His MCCCA study resulted in a framework of 10 CILs being identified as listed in Table 1. Hamlin, Jones, and Ellinger (2019) have conducted a similar MCCCA study by examining the 33 CHs of evidence-based OCD initiatives published in Section 3 of their co-edited book, *Evidence-Based Initiatives for Organizational Change and Development*. The results lend support for the 10 ‘original’ CILs identified by Hamlin (2001b), as indicated by the proportion of CHs (and underpinning ILs) coded against them. As can be seen in Table 1, of the 10 ‘original’ CILs, 9 are ‘quite strongly’ to ‘strongly’ supported and thus validated by 39.39% (n=13) to 81.82% (n= 27) of the 33 CHs. As can also be seen in Table 1, the remaining CIL, Recognising the relevant contributions that the HR function can make and the strategic role it can play in bringing about transformational change, is validated by just 18.18% (n=6) of the CHs; the reason for this low support is not known. Additionally, the MCCA resulted in 10 ‘new’ emergent CILs being identified, most of which were derived from 24.24% to 63.64% (8 to 21) of the 33 compared and contrasted CHs, as shown in Table 2.

Of particular note is that the ILs gained and learned by the authors of 63.64% (n=21) of the examined 33 CHs that contributed to the emergence of CIL - Use of theory and models as change agency tools, and draw

as indicated by Table 3. This table depicts the number of ‘Anglo’ and ‘Non-Anglo’ derived CHs which contain one or more references of each type of OCD ‘best evidence’. The proportion of the 33 CHs where the authors had cited works from each of the four types of ‘best evidence’ were as follows: Type A: 93.94%; Type B: 69.70%; Type C: 63.64%; and Type D: 48.48%. As can be seen in Table 3, the extent to which the four types of ‘best evidence’ were drawn upon by the ‘non-Anglo’ OCD practitioners is similar to that of the ‘Anglo’ OCD practitioners. Furthermore, over 300 OCD-related ‘best evidence’ books, articles and reports were cited and referenced in the 33 reflective case histories (CHs) (see Table 2 in Hamlin, Jones & Ellinger, 2019).

Implications for professional HRD practitioners and other OCD change agents

The findings from the MCCCA study of the 33 CHs published in Section 3 of *Evidence-Based Initiatives for Organizational Change and Development*, as outlined above, demonstrate that evidence-based OCD is a practical ‘reality’ within a wide range of culturally diverse countries around the globe. Furthermore, they demonstrate the existence of a significant body of OCD-related ‘best evidence’ that can be used to help inform, shape, and critically evaluate the formulation and implementation of

We hope this conclusion will be taken as a ‘call for action’ by all professional HRD practitioners who seek to maximize their contribution to the achievement of organizational effectiveness and sustained business success, and thereby increase their credibility and that of the HRD function in the eyes of managers.

upon sources of ‘best evidence’ to inform and guide OCD processes - clearly indicate the reality of EBP in the field of OCD. Interestingly and importantly, the more granular results of our MCCCA suggest the use of best evidence to help formulate and implement OCD strategies and/or to critically evaluate their effectiveness is much more extensive than indicated by this emergent ‘new’ CIL. In fact, the authors of all 33 CHs drew upon at least one of four types of OCD-related ‘best evidence’ publications that were cited and referenced in their respective CHs. These types were as follows: a) Change management/OCD books/handbooks and the Harvard Business Review; b) Books/articles on specific OCD-related theories and models; c) Articles on OCD-related Mode 1 and generalized Mode 2 research; and d) Articles/reports on organization/sector-specific Mode 2 research or investigation. The use of these sources of OCD-related ‘best evidence’ is quite extensive

evidence-based OCD initiatives. Thus, Hamlin et al. (2019) concluded that evidence-based OCD is likely to be a more extensive and widespread phenomenon in Non-Anglo as well as Anglo countries than common discourse suggests.

The 10 validated ‘original’ CILs, and 10 emergent ‘new’ CILs resulting from the MCCCA study reported in the Hamlin, Jones and Ellinger (2019) chapter have significant relevance and utility for organizational leaders, line managers, HRD professional practitioners, OD specialists and change management consultants who are striving to become more effective in their OCD change agency practice. Furthermore, they have equivalent relevance and utility for HRD scholars and practitioners who deliver management and leadership development (MLD) programmes that focus on strategic leadership and change management issues.

Specifically, we would encourage all OCD change

agents, and particularly professional HRD practitioners, to give serious consideration to the relevance and applicability of the 20 CILs to their own change initiatives. Additionally, we would suggest they should critically reflect upon their existing change agency skill sets and identify those that might need to be enhanced and those other skills that may need to be acquired and developed. Furthermore, they should ensure that all colleague managers and staff and/or external change management consultants who are involved in the planning and/or facilitation of their respective OCD initiatives, also possess the requisite change agency skills. Importantly, they should consider whether the best evidence readily available at hand is sufficient to adequately inform and shape the proposed OCD initiative.

If not, they should consider obtaining more of the same or other forms and strengths of best evidence to enhance their change agency practice. Alternatively, they should consider instigating a programme of academically rigorous Mode 2 research, or even Mode 1 research in partnership

with academic researchers, to generate new insights and better understanding of the organizational context prior to implementing their respective OCD initiative.

In conclusion, we hope the 10 validated 'original' CILs, and the 10 potentially emergent 'new' CILs which have yet to be validated by the 'situated expertise' of many more OCD practitioners and their 'critical perspectives' on and 'reflective case histories' of evidence-based OCD initiatives, as outlined in this article, will provide useful guidance to anyone involved in instigating and/or designing and facilitating initiatives for OCD, or is striving to become more research-informed and evidence-based in their change agency practice. Furthermore, we hope this conclusion will be taken as a 'call for action' by all professional HRD practitioners who seek to maximize their contribution to the achievement of organizational effectiveness and sustained business success, and thereby increase their credibility and that of the HRD function in the eyes of managers.

References

- Axelsson, R. (1998). Towards an evidence-based healthcare management. *International Journal of Health Planning and Management*, 13(4), 301-317.
- Brewerton, P., & Millward, L. (2001). *Organizational research methods*. London: Sage.
- Briner, R., Denyer, D., & Rousseau, D. (2009). Evidence-based management: Concept clean-up time? *The Academy of Management Perspectives*, 23(4), 19-32.
- Burnes, B., & Jackson, P. (2011). Success and failure in organizational change: An exploration of the role of values. *Journal of Change Management*, 11(2), 133-162.
- Carnall, C., & Todnem By, R. (2014). *Managing change in organizations* (6th ed.). Harlow, UK: Pearson.
- Gubbins, C., Harney, B., van der Werff, L., & Rousseau, D. M. (2018). Editorial: Enhancing the trustworthiness and credibility of human resource development: Evidence-based management to the rescue? *Human Resource Development Quarterly*, 29(3), 193-202.
- Hamlin, R. G. (2001a). A review and synthesis of context and practice. In B. Hamlin, J. Keep, & K. Ash (Eds.), *Organizational change and development: A reflective guide for managers, trainers and developers* (pp. 13-38). Harlow, UK: FT Prentice Hall.
- Hamlin, R. G. (2001b). Toward research-based organizational change and development. In Bob Hamlin, Jane Keep, & Ken Ash (Eds.), *Organizational change and development: A reflective guide for managers, trainers and developers* (pp. 283-296). Harlow, UK: FT Prentice Hall.
- Hamlin, R. G. (2016a). HRD and organizational change: Evidence-based practice. *Human Resource Development Practice, Policy & Research*, 1(1).
- Hamlin, R. G. (2016b). Evidence-based organizational change and development: Role of professional partnership and replication research. In C. Hughes & M. W. Gosney (Eds.), *Bridging the scholar practitioner gap in human resources development* (pp. 120-142). Hershey, PA: IGI Global.
- Hamlin, R. G. (2019). Organizational change and development: The case for evidence-based practice. In R. G. Hamlin, A. D. Ellinger & J. Jones (Eds.) *Evidence-based organizational change and development* (pp. 1-29). US: IGI Global.
- Hamlin, R. G., Ellinger, A. D., & Jones, J. (2019). *Evidence-based organizational change and development*. US: IGI Global.
- Hamlin, R. G., Jones, J., & Ellinger, A. D. (2019). Concluding reflections and presentation of an EBOCD conceptual process model. In R. G. Hamlin, A. D. Ellinger & J. Jones (Eds.) *Evidence-based organizational change and development* (pp. 724-742). US: IGI Global.
- Hamlin, R. G., Keep, J., & Ash, K. (2001). *Organizational change and development: A reflective guide for managers, trainers and developers*. Harlow, UK: FT Prentice Hall.
- Holton, E. F. III. (2004). Implementing evidence-based practice: Time for a national movement? *Human Resource Development Review*, 3(3), 187-188.
- Kearns, P. (2014). *Organizational learning & development - From an evidence base*. Abingdon, UK: Routledge.
- Kohut, A., & Roth, G. L. (2015). Change management. In R. F. Poell, T. S. Rocco, & G. L. Roth (Eds.), *The Routledge*

- companion to human resource development* (pp. 225–235). Abingdon, UK: Routledge.
- Latham, G. P. (2009). *Becoming an evidence-based manager: Making the science of management work for you*. Boston, MA: Davies-Black.
- McKenzie, C., Garavan, T., & Carbery, R. (2012). Through the looking glass: Challenges for human resource development (HRD) post the global financial crisis-business as usual? *Human Resource Development International*, 15(3), 353–364.
- Morrell, K. (2008). The narrative of ‘evidence-based’ management: A polemic. *Journal of Management Studies*, 45(3), 613–635.
- Pfeffer, J., & Sutton, R. I. (2006). *Hard facts, dangerous half-truths & total nonsense: Profiting from evidence-based management*. Boston: Harvard Business School Press.
- Reay, T., Berta, W., & Kohn, M. K. (2009). What’s the evidence on evidence-based management? *The Academy of Management Perspectives*, 23(November), 5–18.
- Rousseau, D. M. (2012). Envisioning evidence-based management. In D. M. Rousseau (Ed.), *Handbook of evidence-based management*. New York: Oxford University Press.
- Rynes, S. L., & Bartunek, J. M. (2017). Evidence-based management: Foundations, development, controversies and future. *Annual Review of Organizational Psychology and Organizational Behavior*, 4(1), 235–261.
- Shook, L.-V., & Roth, G. (2011). Downsizing, mergers, and acquisitions: Perspectives of human resource development practitioners. *Journal of European Industrial Training*, 35(2), 135–153.
- Stanford, J. (2016). *TD at Work: Breaking the cycle of failed change management*. VA, USA: ATD.
- Stewart, J. (2015). Strategic HRD. In R. F. Poell, T. S. Rocco, & G. L. Roth (Eds.), *The Routledge companion to human resource development* (pp. 203–211). Abingdon, UK: Routledge.
- Stewart, R. (1998). More art than science? *The Health Service Journal*, 26, 28-29.
- ten Have, S., ten Have, W., Huijsmans, A.-B., & Otto, M. (2017). Reconsidering change management: Applying evidence-based insights in change management practice. Abingdon, UK: Routledge.
- Tourish, D. (2013). ‘Evidence based management’, or ‘Evidence oriented organizing’? A critical realist perspective. *Organization*, 20(2), 1–20.

ABOUT THE AUTHORS



Robert (Bob) Hamlin

Bob is Emeritus Professor and Chair of Human Resource Development, University of Wolverhampton, UK. His main research interest focuses on perceived managerial and leadership effectiveness within public and private sector organizations within the UK and 17 other countries. Bob has authored/co-authored 52 peer-reviewed journal articles and contributed 32 chapters to various HRD-related books. He is author of *Universalistic Models of Managerial and Leadership Effectiveness* (VDM Verlag Dr Muller, 2009), and lead co-editor of *Organizational Change and Development: A reflective guide for managers, trainers and developers* (FT Prentice Hall, 2001) and *Evidence-Based Initiatives for Organizational Change and Development* (IGI Global, 2019).

Jenni Jones

Jenni Jones is an Associate Professor at the University of Wolverhampton Business School, UK, where she teaches and researches in HRD, Leadership, Change, Coaching and Mentoring. Her research has been presented at national and international conferences and her most recent publication is as co-editor for *Evidence-Based Initiatives for Organizational Change and Development* (IGI Global, 2019). Previously, she has worked in a variety of HRD leadership roles within both the private and public sector, and currently leads a variety of external organisational change related projects within the Police, the NHS, City Councils and private organisations, in the UK and beyond.



Andrea Ellinger

Andrea Ellinger recently retired as a Professor of Human Resource Development in the Soules College of Business at The University of Texas at Tyler where she remains affiliated. She has received several teaching, research, and service awards during her career, including The Outstanding HRD Scholar Award for 2012 from The Academy of Human Resource Development. She is a former editor of *Human Resource Development Quarterly*. Andrea has an extensive publication record and has presented her research regionally, nationally, and internationally. Her research interests include informal learning, organizational learning and learning organizations, managerial coaching, mentoring, employee engagement, organizational change and development.



International perspective on mathematics teacher professional development: China case and implications for HRD

Jie Ke, Millard Juetta Bingham, Rui Kang & Di Liu

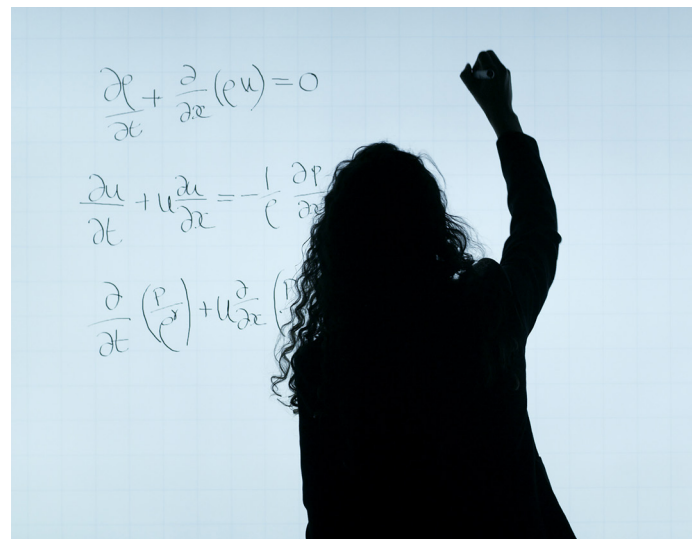
Abstract

The study is to answer the call for HRD's contributions to prepare a quality STEM workforce for the global society by presenting an international perspective on how understanding mathematics preservice teachers' conceptions/beliefs of their own learning and their students' learning can help build a robust teacher professional development (PD) programme. Research studies have identified that the conception/belief of teachers' learning is a critical but missing factor during the process of developing teacher PD programmes, and addressing this factor is likely to improve the effectiveness of PD. A mixed research design was used for the study. One hundred and twenty nine mathematics preservice teachers from two institutions in China participated in the Learning Inventory survey, followed by one classroom case analysis. The study revealed that Chinese mathematics preservice teachers in the study preferred constructivist learning over traditional learning, and strongly endorsed self-regulated learning of students, but their support of social learning was low. It is also found that the teachers' conceptions of their own learning were correlated with that of students' learning. The research provided both theoretical and empirical bases to update the current mathematics teacher PD framework. Implications for PD trainers and HRD professionals in designing and implementing mathematics teacher PD programmes were also presented.

Introduction

The 21st century has witnessed a flatter world with globalization and unprecedented technology development, where science, technology, engineering, and mathematics (STEM) professions become pillars to national economies

worldwide (Friedman, 2005; Waite & McDonald, 2019; Wright et al, 2019). However, the STEM workforce supply and demand imbalance, mismatch between STEM students and STEM employers, and the shortage of quality STEM workers seem to be prevalent problems everywhere, especially in some developed countries such as the United States, the United Kingdom, and Australia. Although human resource development (HRD) can potentially make a great contribution to alleviate and solve the problems by educating and engaging the STEM workforce, the lack of voice in the STEM conversations is unfortunately a reality, as evidenced by the limited amount of scholarly work on "STEM career" and only one article on "STEM education" in the HRD Academy's four journals (Waite & McDonald, 2019). It is therefore meaningful to start the conversation with how HRD can contribute in the field of mathematics education. China is one of the high-



achieving countries in mathematics education. While there has never been lack of research on how Chinese learn and teach mathematics, less attention was paid to how the Chinese prepare and develop their mathematics teachers (Huang, Ye & Prince, 2017). Examining how China educates and develops its mathematics professionals from policy to practice will provide insights of best practices and shed light on future moves to policy makers and HRD professionals, domestically and internationally.

Problem statement

China started the educational reform on mathematics in 2004, which has placed a great emphasis on developing teachers as teacher quality decides student achievement (Wright et al., 2019). Like many other developing countries, China places great stock in teacher professional development (PD) programmes. Besides meeting high standards to get a teaching licence, teachers in China need to be revalidated and registered every five years (MOE,

which evaluated the impact of a NTTP on the academic achievement of students in rural China and revealed an unsatisfactory result. Lu, et al. (2017) further argued that teacher PD programmes can only improve teachers' teaching and students' learning when knowledge is transferred into teaching practice. Knowledge can only be transferred to teaching practice when the teachers in training acknowledge the importance of the piece of knowledge in their belief system, which critically impacts teachers' choice of teaching strategies and practices and decides the effectiveness of their students' learning. This finding is consistent with what the researchers of this study found in the search of possible reasons behind the ineffectiveness of PD programmes theoretically through comparing the hybrid framework of Chinese teacher PD (Huang et al., 2017) and the framework of developing teachers of science and mathematics in the U.S. (Loucks-Horsley, Stile, & Hewson, 2009): an important factor that both frameworks have, but is missing in designing Chinese

Knowledge can only be transferred to teaching practice when the teachers in training acknowledge the importance of the piece of knowledge in their belief system, which critically impacts teachers' choice of teaching strategies and practices and decides the effectiveness of their students' learning.

2013). Over the five years, teachers have to participate in at least 240 hours of professional development. The Chinese teacher PD programmes are supported by two fundamental infrastructures: the systematic bottom-up promotion system and the hierarchical teaching research system with an emphasis on professional competence (Huang et al., 2017). In 2010, the National Teacher Training Program (NTTP), the country's flagship teacher PD programme, was launched to further improve teaching quality and student achievement (MOE & MOF, 2015). In mathematics education in particular, the Ministry of Education released its 2011 version of the curriculum standards, promoting a constructivist epistemology toward the nature of mathematical knowledge; and emphasized conceptual understanding over memorization and the connected nature of knowledge.

Like many other developing countries, China has invested billions of dollars in its teacher PD programmes, of which NTTP launched in 2010 is of the largest scale. The content of NTTP includes ethics in teaching (10%), subject-specific knowledge (40%), and pedagogical practices (50%) (MOE, 2012). The national teaching policy requires teachers to participate in PD training each year. However, limited large scale empirical evaluation of PD programmes in China has been conducted, such as Lu, Loyalka, Shi, Chang, Liu, & Rozelle (2017),

teacher PD programmes - conceptions/beliefs of teacher's learning. Bolhuis and Voeten (2004) also identified another important factor that impacts student's learning through influencing teachers' decisions on teaching strategies: teacher's conceptions/beliefs of student's learning. These findings point to the importance of more research on teachers' conceptions/beliefs of their own learning and their students' to guide future design of PD programmes as teachers' conceptions/beliefs may help explain the disconnect between knowledge and practice. In other words, understanding and clarifying teachers' beliefs/concepts help reveal their mental models of learning and make it possible for teacher trainers to engage trainees in reflecting on such underlying models and developing consistent belief systems during PD activities (Bolhuis & Voeten, 2004).

HRD is known for its contributions to designing and developing effective educator training programmes. However, HRD professionals cannot assist mathematics teacher training and PD in China and improve the learning effectiveness of mathematics teachers and their students without understanding teachers' beliefs of their own learning and their students' as well as the relationship between the two factors. Yet, the search of literature returned no result on such research.

Concepts/Beliefs of Learning

As a global construct, belief is too fussy a construct to lend itself easily to empirical investigation (Pajares, 1992). In this study, we choose to focus on a very specific set of beliefs, that is, teachers' learning-related beliefs or their conceptions of learning (Bolhuis & Voeten, 2004; Chan & Elliott, 2004; Thompson, 1984, 1992). This type of beliefs is also considered as part of a person's epistemology. Studying such epistemological beliefs is important because it affects one's curricular implementation, choices of strategies, and learning environment cultivation (Chan & Elliot, 2004; Schommer, 1994). Researchers often use the terms conceptions and beliefs interchangeably when they address epistemological beliefs (e.g., Chan & Elliot, 2004; Pajares, 1992; Schommer, 1994), and we follow this convention.

Teachers' instructional behaviour or teaching practice is shaped by a myriad of relevant factors that are related to beliefs including knowledge, dispositions, values, motivation, and prior experiences. Although beliefs are entangled with many of the other factors that potentially influence instructional behaviour, the intricate connections between beliefs and these factors make beliefs an ideal construct for an exploratory study like ours, which seeks to capture a wide range of ideas.

Purpose of study and research questions

This study was designed to provide an international perspective on teacher PD in the context of Chinese mathematics education reform through a unique lens of understanding preservice (i.e., teacher candidates or future teachers) mathematics teachers' perceptions of their students' learning and their own learning. Preservice mathematics teachers were chosen as the target population for this study because preservice is the first stage of a teaching career.

Conceptions about learning have formed, from prior experience, cultural values, as well as social expectations, long before preservice teachers begin their teacher education programmes (Chan & Elliott, 2004; Correa, Perry, Sims, Miller, & Fang, 2008; Handal, 2003; Ogan-Bekiroglu & Akkoc, 2009; Pajares, 1992). Such beliefs/conceptions, if contrary to the ideas called for by educational reform, need to be explicitly addressed by PD interventions. Otherwise, they may become forces of resistance to integrating new ideas. On the other hand, if such beliefs/conceptions are aligned with the ideas called for by educational reform, they need to be strengthened through PD and shared with the professional community in order to force stronger links between beliefs and practices. Unarticulated or hidden beliefs, without being addressed, may later be responsible for ineffective or outdated teaching practices (Pajares, 1992). In this sense, only focusing on in-service teachers' beliefs is not adequate. In sum, understanding preservice mathematics teachers' beliefs/conceptions of learning before they enter into the profession will help design a

PD programme to shape teachers' teaching strategies and practices conducive to students' learning. The following questions are used to guide the study:

- How do preservice mathematics teachers view students' learning?
- How do they view their own learning?
- How do their conceptions/beliefs influence their decisions on teaching strategies?
- What are the gaps between mathematics preservice teachers' learning capacities and the national policy of mathematics education in China?
- What are some implications for HRD professionals in designing and implementing teacher PD programmes?

Literature Review

Student-centeredness is one of the leading themes of China's mathematics education reform movement. For instance, the Ministry of Education's standards (2011) made the explicit recommendation that "instruction should actively involve teachers and students into a process of interactions and mutual development. Effective instruction is a union of teaching and learning. Students are centers of learning. The teacher is the organizer, guide, and collaborator" (p. 2).

Teacher professional development and its characteristics

Teacher PD is "the professional growth a teacher achieves as a result of gaining increased experience and examining his or her teaching systematically" (Glatthorn, 1995, p. 41). According to Villegas-Reimers (2003), professional development is different from career development, and carries the following characteristics (pp. 11-13): a) it is based on constructivism rather than on a 'transmission-oriented model'. Teachers should be treated as active learners; b) it is perceived as a long-term process as it acknowledges the fact that teachers learn over time; c) it is perceived as a process that takes place within a particular context; d) many identify this process as one that is intimately linked to school reform, as PD is a process of culture building and not of mere training which is affected by the coherence of the school programme; e) a teacher is conceived of as a reflective practitioner; f) PD is conceived of as a collaborative process; and g) PD may look and be very different in diverse settings, and even within a single setting. In order for a PD programme for teachers to be successful, the programme must be grounded in knowledge about teaching and model constructivist teaching (Corcoran, 1995).

The impact of professional development on teachers: students' learning and educational reform

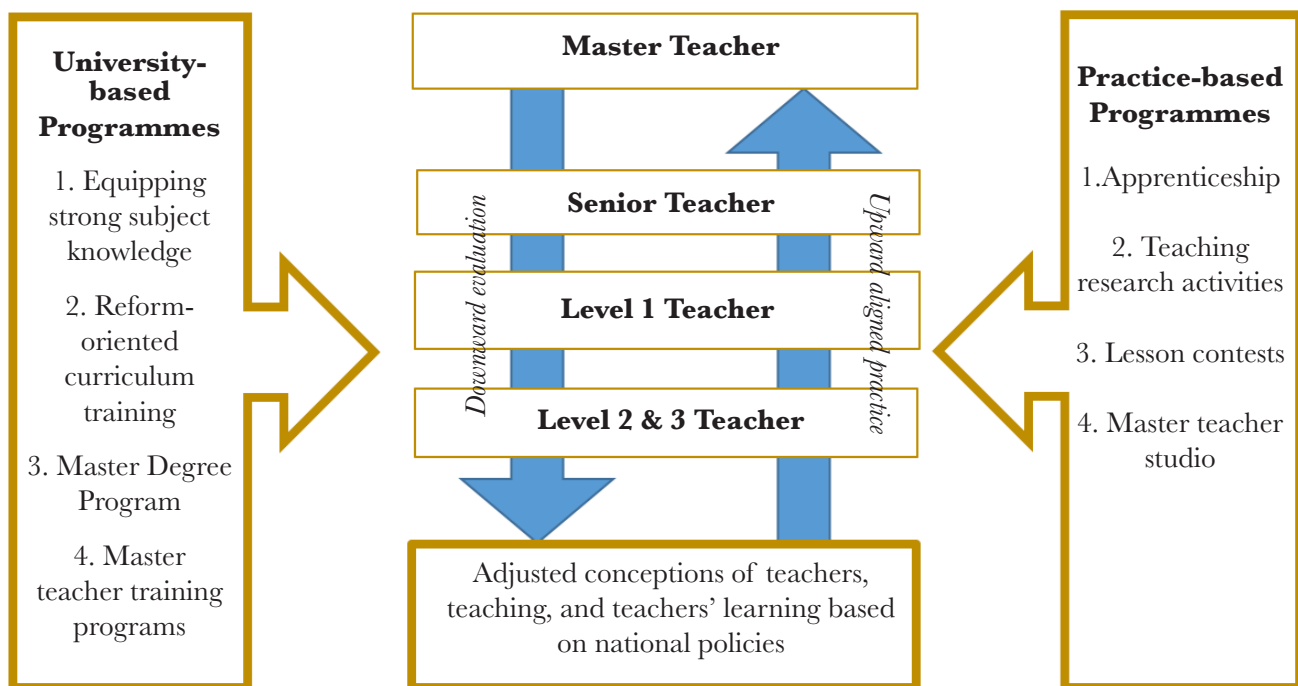
Numerous research studies around the globe have found that successful PD experiences have a noticeable impact on teachers, in and out of classroom (Ball, 2000; Darling-

Hammond, 2006; Henning, 2000; Whitworth & Chiu, 2015). Furthermore, Villegas-Reimers (2003) summarized many research studies on the effect of teachers' PD on students' learning and concluded that the more professional knowledge teachers have, the higher the levels of student achievement are. Borko and Putnam (1995), in particular, pointed out that PD plays an important role in changing teachers' teaching methods, which in turn have a positive impact on students' learning. As to the impact of PD on education reform, many countries, such as Finland, provided a good case where PD of teachers successfully transformed the country's educational systems (Darling-Hammond, 2010; Jamil, 2014; Sahlberg, 2010). In conclusion, PD of teachers plays a key role in ensuring the effectiveness of educational reform at all levels, if any (Villegas-Reimers, 2003).

primary school teachers (Grade 1-6) and secondary school teachers (Grade 7-12). The standards have been updated and raised over the years. "Typically, primary school mathematics teachers are trained in a college of education at a three-year college or four-year university; secondary mathematics teachers are trained in mathematics departments at four-year universities" (Huang, et al., 2017, p. 19). Teachers are accredited through passing the teaching licence exam and revalidation every 5 years. To obtain a teaching licence, a teacher candidate needs to pass both written and oral exams. The written exam tests on many aspects: "Synthesis quality, educational knowledge and skills, subject knowledge, and instructional abilities [mathematics knowledge (41 %), curriculum knowledge (18 %), mathematics teaching knowledge (8 %), and mathematics teaching skills (33 %)]" (p. 19). Only those who pass the written exam can take the oral exam,

Figure 1

A hybrid system of teacher PD in China (Huang, et al., 2017, p. 37)



Hybrid system of teacher PD in China

Huang et al. (2017) proposed a descriptive, hybrid framework for teacher development by synthesizing information of Chinese education system and teacher PD system (Figure 1). The system is built upon the conceptions of teachers, teaching, and teachers' learning. And, the two main fundamental infrastructures for the system are the systematic ranking promotion system and hierarchical teaching research system.

As depicted in Figure 1, China has a comprehensive teacher preparation system, which is comprised of university-based programmes and practice-based programmes. MOE published The Teacher Act in 1994 to specify the minimum education requirements for

which further tests candidates' professional knowledge and skills such as ethics, communication teaching skills, manners, and more. The exams are nothing but rigorous. The passing rate for the written exam is 35% and that for the oral 70.9% from 2011 to 2013. In China, a competitive professional promotion system is used to motivate teachers. In August 2015, The Guidance for Deepening the Reform of Secondary and Primary School Teachers' Promotion System was released by the Ministry of Human Resources and Social Security [MHRSS] and Ministry of Education [MOE] of China to rank all primary and secondary teachers into three levels: the senior-rank (full senior and senior), the intermediate rank (Level 1), and the primary rank (Level 2 and Level 3).

The strengths of the teacher PD system in China are multiple: a well-established ranking and promotion system,

institutionalized teaching research system, and ubiquitous public lesson development, but there is also a weakness that needs immediate attention: lack of preparation in pedagogical content knowledge (Huang et al., 2017; Li, Huang & Shin, 2008; Liang, Claz, Defranco, Vinsonhaler, Grenier & Cardetti, 2013).

In comparison, some Western PD frameworks, such as Loucks-Horsley, Stile and Hewson (2009), focus more on student's learning and culture building. According to the Professional Development Design Framework (Loucks-Horsley, Stile & Hewson, 2009), the first step of designing a teacher professional development programme is to commit to vision and standards; and the next inputs designers acquire to achieve this are knowledge (solid facts and research) and beliefs (knowledge based on personal experience, observations, and convictions). Conceptual Framework for Teacher's Beliefs about Learning

Conceptions about learning are driven by epistemological beliefs. Epistemology is manifested in complex systems that is typically comprised of multiple rather than a single dimension (e.g., Schommer, 1994). A person with a sophisticated belief tends to view knowledge as complex, uncertain, and tentative, gradually gained through reasoning process, and can be constructed by the learner.

In this study, we adopted a similar multifaceted framework of teachers' conceptions of learning designed by Bolhuis and Voeten (2004). This framework was chosen for the following reasons. First, it treats teacher beliefs as a complex, multidimensional construct and reflects the interconnectedness of teacher beliefs as discussed in the research literature (Cooney, Shealy, & Arvold, 1998). Second, Bolhuis and Voeten's Learning Inventory is closely aligned with a student-centered, inquiry-oriented pedagogy which is the underpinning of the current mathematics education reform movements in China. In addition, Bolhuis and Voeten's framework is the only one the researchers have found that examines teachers' implicit beliefs of students' intelligence or ability, in addition to their beliefs about student learning. Implicit belief is an integral parts of a teacher's conceptual system of learning. Examining and comparing such implicit beliefs are relevant and meaningful in the context of Chinese mathematics education. Below we briefly summarize the five sub-components or constructs under Bolhuis and Voeten (2004)'s framework: self-regulation of learning, the construct-character of knowledge, the social nature of learning, a dynamic model of intelligence, and tolerance of uncertainty. For a more detailed and extensive discussion of these constructs, please refer to the original work of these authors.

Self-regulation (or internal regulation) of learning

This dimension addresses teachers' megacognitive beliefs as related to whether learning is more internally regulated by the learner or externally regulated by the

teacher. Mathematics teachers' beliefs about students' self-regulated learning are closely tied to their knowledge of how students learn and think about mathematics, which in turn influence their perceptions of the teacher's roles (Fennema, Carpenter, Franke, Jacobs, & Empson, 1996). The authors categorize teacher beliefs regarding students' abilities to self-regulate into four levels ranging from the belief that students learn best by being told how to do mathematics to the belief that students can solve problems on their own without the need of direct instructions. They also observed that although teachers' beliefs and practices are not always categorized at the same level, there was a clear relationship between beliefs and instructions. This result suggests that studying preservice teachers' beliefs about students' self-regulated learning may help to predict the type of instructors they will eventually become.

The construct-character of knowledge and the social nature of learning

These two dimensions in the Bolhuis and Voeten's (2004) framework reflect the basic tenet of constructivism in that "knowledge is not passively received but is actively built up by the cognizing subject" (von Glasersfeld, 1989, p. 162). Although we do acknowledge that constructivism as an epistemology does not always dictate how one teaches, we also take the stance that there are models of teaching that could be legitimately called "constructivist" (Steffe & D'Ambrosio, 1995). Depending on how teachers interpret constructivism, they might build their own legitimate models of "constructivist teaching" (Steffe & D'Ambrosio, 1995, p. 146). However, there are common elements across these models that are generally accepted as the central characteristics of "constructivist teaching" such as student-led inquiry and social learning. The constructivist-oriented teaching model serves as the underpinning of the mathematics education reform in China. For instance, Ministry of Education's curriculum



standards (2001, 2011) stress, on multiple occasions, the importance of students making conjectures through observations and experience, as well as reasoning about mathematics and making generalizations.

Two common and interrelated features of “constructivist teaching” are student-led inquiry and social learning. Vygotsky’s (1987) original notion of zone of proximal development refers to what students cannot achieve by themselves but can accomplish with the aid of the teacher. Drawing from Vygotsky’s initial conception of the zone of proximal development, Steffe and D’Ambrosio (1995) extend the zone to what they call the “zone of potential construction,” which encompasses various mathematically meaningful contexts that stimulate rich “interactive mathematical communications” including those among the learners themselves (p. 154). Although we have noted that “constructivist teaching” does not always lead to social learning, we do believe that when students develop mathematical understanding through collaborative problem solving, they produce the deepest and most powerful form of knowledge. If social learning results in a truly profound understanding of mathematics, then we believe that it is consistent with the social constructivist theory of teaching and learning (Wood, Cobb, & Yackel, 1991). In addition, we agree with Bolhuis and Voeten (2004) that if a teacher conceptualizes learning as a social process, they are also likely to value the process of learning rather than give attention only to the end results, and thus, is a process-oriented teacher.

Fixed versus dynamic ability

Dweck and her colleagues conducted research to solve the puzzling phenomenon, of why individuals of equal abilities respond to challenges with marked differences which eventually lead to quite different levels of achievement (e.g., Dweck & Leggett, 1988). They formed, tested, and verified a couple of hypotheses: (1) People who pursue performance goals (concerned with gaining favourable evaluation of their performance) are likely to develop the “helpless” learner pattern and show vulnerability when facing learning challenges; while people who seek learning goals (concerned with increasing skills or competence) are likely to seek challenge and be persistent in their efforts. (2) The views of intelligence as fixed versus incremental (implicit theories of intelligence) predict adoption of different learning goals. In particular, people who view one’s intelligence as fixed (entity theorists) tend to adopt performance goals; while those who view one’s intelligence as malleable (incremental theorists) tend to adopt mastery goals. Traditional beliefs about mathematics teaching and learning may be associated with the entity theory of intelligence and ability because of their shared emphasis on the product of learning or the end results (Stipek, Givvin, Salmon & MacGyvers, 2001). Teachers who view intelligence and ability as fixed entities may not be persistent in their efforts to help the students that they deem as possessing low abilities. On

the other hand, constructivist teaching and learning are aligned with the incremental theory of intelligence and ability because both theories emphasize the process of knowledge construction (Bolhuis & Voeten, 2004). When facing challenges, teachers who view intelligence and ability as incremental are likely to examine and modify their teaching process in order to bring out maximized learning outcomes from their students.

Tolerance of uncertainty

This dimension, according to Huber and Roth (1999) is closely related to how a teacher would respond to demands for reform such as self-directed learning, active construction of knowledge by the learner, and social and co-operative learning discussed above. Teachers with a low tolerance tend to be less receptive to reform ideas that are inconsistent with their current belief system. They are also more likely to be less tolerant to asking students open-ended questions, providing minimal guidance during student problem solving process, and letting students generate alternative solution methods. On the other hand, teachers with a high tolerance are likely to be more comfortable with integrating innovative ideas and strategies and adopting the instructional strategies listed above (Bolhuis & Voeten, 2004).

Methodology

The study used mixed methods in collecting data. The quantitative part used the adapted survey instrument developed by Bolhuis and Voeten (2004), and the qualitative part extended Bolhuis and Voeten’s study to include structured interviews with preservice teachers who performed an analysis of a classroom vignette. Considering the framework for this study is adapted from studies in Western literature, qualitative interviews provide more indigenous information about the targeted population in the context of China and Chinese mathematics education.

Furthermore, Munby (1984) argued that although traditional inventories may reveal salient beliefs that warrant further attention, the items on these inventories may or may not correspond to the unique professional reality of each individual teacher. Therefore, additional measures such as structured interviews of responses to dilemma and vignettes [emphasis is added], or direct observation of behaviour are recommended (Pajares, 1992).

Translation

Data were collected using the Learning Inventory developed by Bolhuis and Voeten (2004). We each translated the Learning Inventory from English to Chinese separately. The two versions were compared and discussed until we reached agreements that the draft translation has kept the meaning of the English version satisfactorily. The draft version was sent to the course instructors in China who have no knowledge of the English version. The instructors applied the back translation procedure and provided comments for our original translation. After receiving

feedback, some meanings and concepts were clarified through further discussions before the finalized instrument in Chinese was administered to the two Chinese samples described below.

Participants

Convenience sampling was used in the survey study. A total of 129 preservice mathematics teachers from China participated. The sample included grade 7-12 preservice mathematics teachers who were respectively enrolled in two 4-year teacher preparation programmes at two universities, one on the Southeast coast of China and the other in Central China. Among the 129 Chinese preservice teachers, 74 were female; 35 were male; 20 did not identify their gender on the returned questionnaires.

Learning inventory

Bolhuis and Voeten's (2004) Learning Inventory contains two parts. The first part includes 24 items on student learning and the second part consists of 22 items on the teachers' own learning. Each item consists of two contrasting statements, a more constructivist-oriented statement and a more traditional statement. The items were randomized, with the constructivist-oriented statement as often on the left as on the right. The participants were asked to indicate whether they endorsed the statements on the left or the ones on the right. All the items were written on a four-point scale:

1. I quite agree with the statement on the left.
2. I agree somewhat more with the statement on the left than I do with the one on the right.
3. I agree somewhat more with the statement on the right than I do with the one on the left.
4. I quite agree with the statement on the right.

We reported our results using the same arrangement such that the statement on the right side always refers to a constructivist-oriented conception, and the one on the left reflects a more traditional view. For the items which were written in the reversed direction in the randomized version we administered to our samples, we reversed their scores before further analysis. Appendix A provides two sample items from the inventory; the first item is from the teachers' conceptions of student learning portion, and the second, from the conceptions of their own learning portion. The Inventory was empirically validated by Bolhuis and Voeten (2004) with Dutch secondary school teachers in light of the Dutch educational innovation of "house of study" (i.e., learning communities for students) and have satisfactory validity and reliability (Bolhuis & Voeten, 2004). However, we will report our own validity and reliability indices in our study with Chinese preservice mathematics teachers.

Case-based structured interview

In this study, we draw from literature on case-based learning in teacher education (Markovits & Smith, 2008; Merseth, 1996). Authentic cases based on classroom events have been shown as useful tools for enhancing individual reflections. When presenting a case of teaching

during the PD sessions, the trainer may direct teachers' attention to either knowledge or pedagogical strategies or how teachers interact with students. In our study, we focused on the latter to help us gain further insights into teachers' beliefs of learning. The case was adapted from Case 4: Slippery Cylinders from Merseth's (2003) casebook, *Windows on Teaching Math: Cases of Middle and Secondary Classroom* (Appendix B). We found and administered an equivalent translated version of this case in Chinese. We designed three questions in order to solicit comprehensive responses from the preservice teachers. The three questions correspond to the five dimensions of the Learning Inventory and therefore, helps us compare against the quantitative findings. These questions are complementary to the Likert-scale responses in the way of offering opportunities for the participants to provide rich and elaborated descriptions of their responses (Appendix C).

Data analysis and results

All of the 129 preservice mathematics teachers responded to the survey, and 109 Chinese preservice teachers from the entire sample of 129 answered the first case question (response rate = 92%), and 83% reported that they supported Ms Lister's use of social learning in the case. Similarly, 120 Chinese preservice teachers responded to the second case question (response rate = 93%), and 89% endorsed Ms Lister's approach that allowed students to make mistakes while discussing the problem with their peers without providing the correct solution up front. Finally, 118 Chinese preservice teachers responded to the third case question (response rate = 91%), and 77% believed that Ms Lister calling on Lucy to explain her problem solving in front of the class was appropriate.

The quantitative responses to the Learning Inventory was analyzed using mainly descriptive statistics such as means, standard deviations, frequencies, and percentages due to the descriptive and exploratory nature of this study. In addition to descriptive statistics (e.g., means, standard deviations), Pearson correlation, exploratory factor analysis (EFA), and Confirmatory Factor Analysis (CFA) were conducted to analyze the data.

We analyzed the interview data with a modified grounded theory approach (Fives & Buehl, 2008; Glaser & Strauss, 1967; Strauss & Corbin, 1998). Following a process called "open coding", we identified and noted the most common and recurrent themes. We supported each of the identified themes with specific quotes from the preservice teachers. A modification to the grounded theory approach was to constantly triangulate the patterns and relations identified in the qualitative data with our conceptual framework and with the Likert-scale data.

Results from quantitative analysis

There were only a few missing values (less than 0.1%) in the sample. These missing values were replaced with the score of the highest frequency for that particular item. In order to correlate the factors of student learning with those

Table 1

Scale Mean Scores, Standard Deviations, and One-Sample t-tests (N = 129)

	M	SD	t(df=128)
Conceptions of student learning			
Individual versus Social Learning	3.14	0.47	15.47***
External versus Internal Regulation of Knowledge Construction	3.29	0.41	21.88***
Fixed versus Dynamic Ability	3.01	0.47	12.32***
Conceptions of own learning			
Social & Lifelong Learning versus Individual & Limited Learning	3.54	0.42	21.88***
Externally versus Internally regulated learning	3.04	0.47	13.06***
Knowledge as Fixed versus Knowledge as Actively Constructed	2.78	0.55	5.78**

Note: ** $p < .01$, *** $p < .001$ means are significantly higher than the neutral point (2.50)

of their own learning, mean scale scores (i.e., the mean of the observed item means, with equal weighting of all items belong to that factor) were computed for all the preservice teachers. The criteria specified by Cohen (1988) to interpret the strength of the correlation coefficients, specifically, $0.10 < r < 0.30$ is interpreted as a weak correlation, $0.30 < r < 0.50$ as a moderate correlation, and $r > 0.50$ as a strong correlation.

Exploratory factor analysis and confirmatory factor analysis

Since the Learning Inventory was not originally designed for Chinese preservice teachers, we examined the validity and reliability of the inventory by applying EFA first. As a result, 13 (out of 24) items were retained for the conceptions of student learning portion; and 16 (out of 22) items were retained for the conceptions of own learning portion. In other words, seventeen items were removed from the Learning Inventory due to their confusing loadings. The result is not unusual in cross-cultural adaptations of instrument. For example, in adapting Chan and Elliott's (2004) Conceptions of Teaching and Learning Questionnaire, which was originally designed for Hong Kong student teachers, Sahin and Yilmaz (2011) deleted 21 items from the original instrument and retained only nine reliable items which the authors considered were able to best represent Turkish preservice teachers' conceptions. The total variance, explained for the conceptions of student learning, was about 46%, and for the conceptions of own learning, about 43%. The overall reliability alpha for conceptions of student learning was .71, and for conceptions of own learning was .73. The overall reliability was .69. These reliability indices met Nunnally's (1978) minimum criterion ($> .60$) for early-stage, exploratory study like ours.

The factor structure extracted from the EFA was validated by CFA with the maximum likelihood method of estimation. Satisfactory goodness of fit indices were

found for both conceptions of student learning (CFI: .96, RMSEA: .03, SRMR: .06) and conceptions of own learning (CFI: .91, RMSEA: .04, SRMR: .07). We used the criterion specified in Hu and Bentler (1999) to interpret these fit indices. In particular, values over .90 indicate good fit for CFA, values below .05 indicate good fit for RMSEA, and values below .08 indicate good fit for SRMR. The resulting factor structure also supported Bulhuis and Voeten's (2004) conclusion that conceptions of student learning and own learning are multi-dimensional constructs. However, the factor structure found by Bolhuis and Voeten was not replicable in this study. In our EFA, we only extracted three instead of five factors. In our analysis, the conceptions of student learning portion included three factors, and we labelled them: Individual versus Social Learning (4 items), External versus Internal Regulation of Knowledge Construction (5 items), and Fixed versus Dynamic Ability (4 items). The conceptions of own learning are also comprised three factors, and we labelled them: Social and Lifelong Learning versus Individual and Limited Learning (6 items), Externally versus Internally Regulated Learning (6 items), and Knowledge as Fixed versus Actively Constructed (4 items). The three factors extracted for conceptions of own learning were not parallel to the three factors for conceptions of student learning. This result was not consistent with the findings of Bolhuis and Voeten (2004).

Correlations between conceptions of student learning and conceptions of own learning

All the correlations, except one, were positive, and are included in Appendix D. The correlations varied between -.07 and .41. Our results support Bolhuis and Voeten's (2004) conclusion that within-set correlations (i.e., between two factors in conceptions of student learning or between two factors in conceptions of own learning are more or less correlated with each other, but the correlations are

not so high as to suggest that they are measuring the same construct. This finding suggests that the preservice teachers' conceptions of student learning and their conceptions of own learning tend to be consistent with and moderately correlated with each other.

Preservice teachers' beliefs of student learning

Scale-level and item-level descriptive and inferential statistics are reported in Table 1 and Table 2 respectively. Preservice teachers in the study in general endorsed the constructivist and process-oriented conceptions. The mean scores for all three factors were above the neutral point 2.5, and in fact all three mean scores were above 3, with the maximum possible score being 4, varying between 2.69 and 3.55 (also see Table 1).

In addition, all the item scores are significantly higher than the neutral point of the scale (2.50) with p-values less than .001; except for one item with p-value less than .01. The Chinese preservice teachers seemed to strongly believe that students benefit from explaining things to each other and examining different viewpoints, as well as thinking independently and passing their own judgment (also see Table 2).

Preservice teachers' conceptions of own learning

Scale-level and item-level descriptive and inferential statistics are reported in Table 1 and Table 3 respectively. Regarding conceptions of own learning, the sample generally endorsed the constructivist conceptions. The mean scores for all the three factors were significantly above the neutral point (also see Table 1).

The mean scores for the items on the factor Social and Lifelong Learning versus Individual and Limited Learning are very high (also see Table 3), indicating very strong beliefs that the teachers were capable of learning from others and continuing to grow as learners throughout their own careers. It should also be noted that when their own learning was concerned, the preservice teachers tended to blur the boundary between social learning and continuous learning as adults. This fact explains why items from two of the original factors in Bolhuis and Voeten's (2004) findings, Individual versus Social Learning and Fixed versus Dynamic Ability, loaded on the same factor in our study. However, this was not the case for the preservice teachers' conceptions of student learning.

The surveyed preservice teachers showed the support for internal regulation of own learning as they think of their students' learning. On all but one item in this factor, the Chinese preservice teachers (mean scores ranging from 2.74 to 3.64) leaned strongly toward the constructivist-oriented conceptions of learning (also see Table 3). In particular, the Chinese preservice teachers strongly endorsed the statement "I learn most from a study day when I have to find out and experience myself how it

works" ($M = 3.64$).

Finally, on the third and last factor for conceptions of own learning, Knowledge as Fixed versus Actively Constructed, the surveyed preservice teachers strongly endorsed on two of the items but were neutral about the rest of the two items (also see Table 3).

Results from interviews of case analysis

The richness of the qualitative responses made it possible for us to gain additional and deeper insights into the teachers' beliefs about student learning, which would have not been possible if we had relied solely on the Likert-scale responses to the Learning Inventory. Three themes were extracted from data analysis.

Our first theme is that the teachers rarely gave superficial or emotional reasons alone when they offered their justifications for the case instructor's pedagogical decisions. For instance, their conception of social learning was grounded in content knowledge and conceptual understanding. The other benefits of social learning such as the hands-on features, enlivened classroom environments, increased participation, higher motivation and a heightened sense of solidarity and collective pride were also mentioned, but they were seen as the positive by-products generated from social learning rather than the ultimate goal. Below is a typical response from the preservice teachers:

Group work will benefit students' understanding because during discussions all kinds of questions will be raised and this process is very valuable. It allows students to think problems from different perspectives and therefore, deepen their understanding. I would treat this lesson in a very similar way because good teaching is not given out answers immediately but asking students to discuss first.

The following preservice teacher seems to have found some compatibility between social learning espoused in the constructivist orientation of learning originated in the West with the Eastern wisdom in Confucius:

Social learning will benefit students because Confucius said, 'walking along with three people, my teacher is sure to be among them.' Through group work, students will gain deeper understanding of what Confucius said. The teacher is not the only one in the classroom who can teach students knowledge. Classmates can be teachers too. This will make their learning more effective. Small group discussions allow students to explore on their own. They not only enjoy the process but also gain deeper understanding of the problem. This is much better than rote memorization. Small group work can also improve students' ability to community and co-operate with each other. These are the social skills that will benefit students when they enter the society.

The second theme is that although the Chinese preservice mathematics teachers were generally in favour of the social learning, self-regulation, and the constructivist aspects, they simultaneously expressed some reservations toward how the case lesson was orchestrated. For instance,

many Chinese preservice teachers in their responses wanted the instructor in the case to set students to the right direction first and correct students' obvious mistakes in a timely fashion. It is possible that the Chinese preservice teachers' insistence on more teacher involvement in the process of mathematical inquiry reflects Chinese culture's emphasis on a more balanced and mixed approach to teaching and learning. Here is a typical response from the Chinese preservice teachers:

- During small group work, the teacher should be the guide, guiding students to the right direction and providing students with clues and hints so that students will discover the answers purposefully. Small group work then becomes a rewarding process. If the teacher simply asks students to explore freely and randomly, students will go off the right track. It will create chaos in the classroom. Then small group work fails to develop students' reasoning skills.

The third theme is that the majority of the Chinese preservice teachers do not believe that learning difficulty is necessarily attributed to low intelligence or ability, a result which is consistent with the past research on Chinese learners (Wang & Lin, 2005). Other factors might have played a role, according to the preservice teachers, which include attitudes and learning strategies. This result shows that it is important to not only study teacher beliefs in regards to whether ability is fixed or incremental but also

achievers are low-achievers because they lack self-confidence and give up too early. If they find out that there are things that they do understand, they are likely to gain confidence and desire to learn. Therefore, I think we should encourage them to speak up in class.

- First, low-achievers may not necessarily be low in their abilities. Most of the times, their IQs are not that different from the rest of the students. Rather, low-achievers typically have poor learning strategies and attitudes. Therefore, teachers may help low-achievers improve their achievement by helping them adjust their attitudes ...

To conclude, the results from the two different data collection methods are highly consistent with each other: Chinese preservice teachers not only endorsed the constructivist-oriented (or process-oriented) conceptions of learning but also its possible enactment in a real mathematics classroom.

Discussions

In general, the Chinese preservice teachers in our study showed a strong preference and support for constructivist conceptions of learning over traditional conceptions of learning. It is surprising to see the overwhelming support for student self-regulation and self-motivation/initiative expressed by the Chinese preservice teachers. This might be the reason why Chinese students are less likely to

It is surprising to see the overwhelming support for student self-regulation and self-motivation/initiative expressed by the Chinese preservice teachers. This might be the reason why Chinese students are less likely to become “helpless learners” and why China is one of the high-achieving countries in mathematics teaching and learning.

understand how teachers attribute students' academic success. Below are some of the typical responses regarding a low-achieving student, Lucy, featured in the case:

- I think Ms Lister gave Lucy a chance is correct because although Lucy's ability to understand the mathematical concepts was low, but she was hard working and hard work would make up for low ability. Good teachers don't give up on students. Ms Lister's way of treating Lucy is also good for encouraging all low-achievers to work harder.
- I attribute a low-achiever's failure to her teacher's attitude. I always believe that an excellent teacher should know not only how to make excellent students better but also how to help every student become better.
- I would treat Lucy as Ms Lister did. Sometimes, low-

become “helpless learners” and why China is one of the high-achieving countries in mathematics teaching and learning. This belief should be supported and strengthened in teacher PD programmes.

It was also found that Chinese preservice teachers did not perceive strong preference over students' social learning, which echoed the findings of existing literature (Chan, Tan & Khoo, 2007; Huang et al., 2017; Li, Huang & Shin, 2008; Liang, Claz, Defranco, Vinsonhaler, Grenier & Cardetti, 2013). This result shows that there is still a gap between teachers' beliefs and the goal of national policy on social learning, which should be the focus of teacher PD programmes.

In terms of conceptions of own learning, the Chinese preservice teachers strongly believed that they were capable of learning from others and continuing to grow as

learners throughout their teaching careers. As to whether preservice teachers' conceptions of student learning were in agreement with the conceptions of their own learning, the researchers found a moderate to moderately strong agreement between the two, which supports the coherence theory of conceptions (Correa, Perry, Sims, Miller & Fang, 2008). This result confirms the importance of understanding and adjusting teacher beliefs of their own learning and their students' learning before and during the teacher PD training in order to improve student learning outcome.

Conclusions and implications for HRD professionals

As literature revealed, for mathematics teacher PD programmes with millions of dollars of investment, such as NTTP, to be effective, we have to first understand teachers' beliefs of their own learning and their students' learning. This study sheds light on areas where HRD professionals can work on in terms of designing, developing, and implementing teacher PD programmes.

Comparing the findings of the study to the national guidelines for reforming mathematics education in China, the researchers identified some gaps although alignments


being able to evaluate their own learning. This too must be acknowledged and included in the training delivery strategies. Findings further illustrated that Chinese preservice teachers are capable of learning from others and that they can continue to grow as learners. This concept highlights the utility that preservice training can have upon the effectiveness of Chinese preservice teachers. PD should be conceived of as a collaborative process. The most effective PD occurs when there are meaningful interactions with all stakeholders (Villegas-Reimers, 2003).

Theoretical implications for HRD professionals

This study filled the void in HRD scholarship on STEM workforce education and preparation and updated the current PD model to guide PD trainers and HRD professionals in their practices of preparing STEM workforce and advancing STEM field.

We also recommend that the hybrid teacher PD framework in China proposed by Huang, et al. (2017) be updated to include teachers' beliefs of student learning as well as continuous evaluation of whether beneficial teaching beliefs are transferred into teaching practices.

In addition, Jean Piaget's concepts of assimilation

 **One finding that is of utmost importance is that Chinese preservice teachers do not attribute learning difficulty to low intelligence.**

do exist. Learning should be a constructive social process, which has not yet been fully reflected in the belief system of the preservice mathematics teachers. The Chinese preservice teachers believe that students benefit from explaining things to each other and examining different viewpoints. This should be taken into account when designing training programmes for teachers. Training activities should allow the preservice teachers themselves to model explaining lesson topics and also exposing them to differing viewpoints. In addition, they should be trained to create learning experiences for their students that allow the students themselves to explain mathematics constructs and to allow the students to explore differing viewpoints. Ministry of Education of China's standards (2011) stated: "Students should be given time and space to observe, experiment, make conjectures, compute, reason, and verify in mathematics learning" (pp. 2-3). Future PD programmes need to develop training strategies to reinforce the social learning of pedagogical content knowledge.

Preservice mathematics teachers in this study endorse constructivist conceptions. Villegas-Reimers (2003) noted several new perspectives of PD for teachers. It is based on constructivism rather than as a transmission-oriented model (e.g. teachers are active learners). This notion can be further strengthened in teacher PD training.

This research also indicated strong support for students

and accommodation may be a useful framework for understanding preservice teachers' belief systems (see Ginsburg & Opper, 1988). In particular, assimilation is a process by which new information is incorporated into the existing beliefs. This happens when the current belief system is considered largely satisfactory so only small modifications are needed. Accommodation, on the other hand, happens when new information is generally considered incompatible with the current belief system. Therefore, fundamental changes of the existing belief system is needed, including replacement and reorganization. The five constructs in the framework used for our study should be included to reflect the multiple aspects of teachers' beliefs in the future PD framework to guide mathematics educator training in China.

In light of this framework, Chinese preservice teachers appear to already embrace reform-oriented beliefs, and therefore, HRD professionals and trainers may focus on helping teachers integrate new ideas into their current systems. They may also focus more on how to assist teachers in realizing their beliefs in classroom practices instead of focusing on establishing new beliefs. However, this does not say it is not important to confront inconsistent beliefs.

Practical implications for HRD professionals

In designing and developing a teacher PD programme, HRD professionals are recommended to assess and understand teachers' underlying beliefs of their own learning and their students learning. In this way, PD activities can be designed accordingly to either strengthen or confront teacher beliefs through cultivation of individual reflections and group discussions. Additionally, HRD professionals should make sure that desired or targeted beliefs (e.g., beliefs that are consistent with call for mathematics educational reform) are actually transferred into classroom practices by follow-up observations and interviews.

Chinese preservice teachers indicate that they value PD and that they believe in the utility of the concept of lifelong continuous learning. PD should be a long term process, as teachers learn over time. A series of related experiences are the most effective as teachers can relate their prior knowledge to new experiences. Regular follow-up serves as an indispensable part of the change process (Schifter, Russell & Bastable, 1999). Chinese preservice teachers indicated that they learn the most when they find out and experience themselves how it works for them. This clearly indicates that hands-on practical learning will likely be the most effective method when designing training activities for Chinese preservice teachers. Chinese preservice teachers prefer hands-on activities, enlivened classroom/training

environments. PD is best when it takes place in a particular context (e.g. actual classroom environment). When this takes place, schools are transformed into communities of learners and communities of inquiry (McLaughlin and Zarrow, 2001) and professional communities (King and Newmann, 2000). Chinese preservice teachers believe that it is the teacher's job to set the students on the right path with their learning and to correct the students' mistakes in a timely fashion.

One finding that is of utmost importance is that Chinese preservice teachers do not attribute learning difficulty to low intelligence. This is of importance in that it demonstrates that Chinese preservice teachers are committed professionals and that they will diligently labour to ensure that all students are successful with their learning. "The vast majority of teachers and school administrators we have encountered are dedicated professionals who work hard under demanding conditions" (Guskey & Huberman, 1995, p. 1). Chinese preservice teachers are more likely to blame their own teaching strategies and/or methods than the student's ability or intelligence level. This is of great utility to HRD professionals as it indicates that Chinese preservice teachers are very receptive to innovative teaching strategies. HRD practitioners are poised to be able to have a very positive impact upon the growth and PD of Chinese preservice teachers through examining the conceptions and beliefs of teachers.



References

- Ball, A. F. (2000). Preparing teachers for diversity: Lessons learned from U.S. and South Africa. *Teaching and Teacher Education*, 16, 491-509.
- Bolhuis, S., & Voeten, M. J. M. (2004). Teachers' conceptions of student learning and own learning. *Teachers and Teaching: Theory and Practice*, 10(1), 77-98.
- Borko, H., & Putnam, R. T. (1995). Expanding a teacher's knowledge base: A cognitive psychological perspective on professional development. In T. R. Guskey & M. Huberman (Eds.), *Professional development in education: New paradigms & practices* (pp. 35-66). New York, NY: Teachers College Press.
- Chan, K. W., & Elliott, R. G. (2004). Relational analysis of personal epistemology and conceptions about teaching and learning. *Teaching and Teacher Education*, 20, 817-831. doi:10.1016/j.tate.2004.09.002
- Chan, K. W., Tan, J., & Khoo, A. (2007). Preservice teachers' conceptions about teaching and learning: A closer look at Singapore cultural context. *Asia-Pacific Journal of Teacher Education*, 35, 181-195. doi:10.1080/13598660701268593
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, N.J.: Lawrence Erlbaum.
- Cooney, T. J., Shealy, B. E., & Arvold, B. (1998). Conceptualizing belief structures of preservice secondary mathematics teachers. *Journal for Research in Mathematics Education*, 29, 306-333.
- Corcoran, T. B. (June, 1995). *Helping teachers teach well: Transforming professional development*. Consortium for Policy Research in Education (CPRE) Policy Briefs. Philadelphia, PA: University of Pennsylvania.
- Correa, C. A., Perry, M., Sims, L. M., Miller, K. F., & Fang, G. (2008). Connected and culturally embedded beliefs: Chinese and US teachers talk about how their students best learn mathematics. *Teaching and Teacher Education*, 24, 140-153. doi:10.1016/j.tate.2006.11.004
- Darling-Hammond, L. (2006). Constructing 21st-century teacher education. *Journal of teacher education*, 57(3), 300-314.
- Darling-Hammond, L. (2010). *What we can learn from Finland's successful school reform*. Retrieved from <http://www.nea.org/home/40991.htm>
- Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review*, 95(2), 256-273.
- Fennema, E., Carpenter, T. P., Franke, L. L., Jacobs, V. R., & Empson, S. B. (1996). A longitudinal study of learning to use children's thinking in mathematics instruction. *Journal for Research in Mathematics Education*, 27(4), 403-434.
- Fives, H., & Buehl, M. M. (2008). What do teachers believe? Developing a framework for examining beliefs about teachers' knowledge and ability. *Contemporary Educational Psychology*, 33, 134-176.
- Friedman, T. L. (2005). *The world is flat: A brief history of the twenty-first century*. New York, NY: Farrar, Straus, and Giroux.
- Ginsburg, H. P., & Opper, S. (1988). *Piaget's theory of intellectual development (3rd. ed.)*. Englewood Cliffs, NJ: Prentice-Hall.
- Glaser, B., & Strauss, A. (1967). *Discovery of grounded theory*. Chicago: Aldine.
- Glatthorn, A. (1995). Teacher development. In L. Anderson (Ed.), *International encyclopedia of teaching and teacher education (2nd ed.)* (pp.38-55). London, England: Pergamon Press.
- Guskey, T. R., & Huberman, M. (1995). *Professional development in education: New paradigms and practices*. New York, NY: Teachers College Press.
- Handal, B. (2003). *Teachers' mathematical beliefs: A Review*. *The Mathematics Educator*, 13(2), 47-57.
- Henning, E. (2000). Walking with barefoot: An ethnographically fashioned casebook. *Teaching and Teacher Education*, 16, 3-20.
- Hu, L. -T., & Bentler, P. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives, *Structural Equation Modeling*, 6, 1-55.
- Huang, R., Ye, L., & Prince, K. (2017). Professional Development of Secondary Mathematics Teachers in Mainland China. In B. Kaur et al. (eds.) *Professional Development of Mathematics Teachers* (pp. 17-31). Springer, Singapore.
- Huber, G. L., Roth, J. H. W. (1999). *Finden oder suchen? Lehren und Lernen in Zeiten der Ungezißheit [Finding or searching Teaching and learning in uncertain times]*. Schwangau: Ingeborg Huber.
- Jamil, H. (2014). Teacher is matter for education quality: A transformation of policy for enhancing the teaching profession in Malaysia. *Journal of International Cooperation in Education*, 16(2), 181-196.
- King, M. B., & Newmann, F. M. (2000). Will teacher learning advance school goals?. *Phi Delta Kappan*, 81(8), 576.
- Li, S., Huang, R., & Shin, Y. (2008). Mathematical discipline knowledge requirements for prospective secondary teachers from East Asian perspective. In P. Sullivan & T. Wood (Eds.), *Knowledge and beliefs in mathematics teaching and teaching development* (pp. 63-86). Rotterdam, The Netherlands: Sense.
- Li, Y., & Huang, R. (2008). Developing mathematics teachers' expertise with apprenticeship practices and professional promotion system as contexts. Paper presented at US-Sino Workshop on Mathematics and Science Education: Common Priorities that Promote Collaborative Research. June 22-June 27, 2008, Murfreesboro, TN.

- Liang, S., Claz, S., Defranco, T., Vinsonhaler, C., Grenier, R., & Cardetti, F. (2013). An examination of the preparation and practice of grades 7–12 mathematics from the Shangdong province in China. *Journal of Mathematics Teacher Education*, 16, 149–160.
- Liu, C., Zhang, L., Luo R., Rozelle, S., Sharbono, B., Shi, Y. (2009). Development challenges, tuition barriers and high school education in China. *Asia Pacific Journal of Education*, 29(4), 503–520.
- Lu, M., Loyalka, P., Shi, Y., Chang, F., Liu, C., & Rozelle, S. (2017). The impact of teacher professional development programs on student achievement in rural China. *Rural Education Action Program Working Paper*, 313.
- Loucks-Horsley, S., Stile, K., & Hewson, P. (2009). *Designing professional development for teachers of science and mathematics*. Thousand Oaks: CA: Sage.
- Markovits, Z., & Smith, M. (2008). Cases as tools in mathematics teacher education. In D. Tirosh & T. Wood (Eds.), *Tools and processes in mathematics teacher education* (Vol. 2, pp. 39–64). Rotterdam: Sense Publishers.
- McLaughlin, M.W. & Zarrow, J. (2001). Teachers engage in evidence based reform: Trajectory of teachers inquiry, analysis and action. In A. Leiberman & L. Miller (Eds) (pp. 79-101). *Teachers caught in the action: Professional Development that matters*. New York: Teachers College Press.
- Merseth, K. K. (1996). Cases and case methods in teacher education. In J. Sikula, T. J. Buttery, & E. Guyton (Eds.), *Handbook of research on teacher education* (2nd ed., pp. 722–744). New York: Macmillan.
- Merseth, K. K. (Ed.). (2003). *Windows on teaching math: Cases of middle and secondary classrooms*. New York, N.Y.: Teachers College Press.
- Ministry of Education (MOE) (2001). *义务教育数学课程标准 (实验稿)* [*Mathematics Curriculum Standards for Compulsory Education (Trial version)*]. Beijing: Beijing Normal University Press.
- Ministry of Education (MOE) (2011). *义务教育数学课程标准* [*Mathematics curriculum standards for fulltime compulsory education*]. Beijing: Beijing Normal University Press.
- Ministry of Education (MOE) (2012). Training Framework of National Teacher Training Program. Government of China. Retrieved from: <http://old.moe.gov.cn/ewebeditor/uploadfile/2012/10/12/20121012170215824.pdf>
- Ministry of Education (MOE) (2013). Interim rules for regular registration of teacher qualification certificate. Retrieved from http://www.moe.gov.cn/publicfiles/business/htmlfiles/moe/s7711/201309/xxgk_156643.html (in Chinese).
- Ministry of Education and Ministry of Finance (MOE & MOF) (2015). Notice of Reforming the National Training Plan for Pre-school, Primary and Secondary Education Teachers. Government of China. Retrieved from http://www.mof.gov.cn/zhengwuxinxi/zhengcefabu/201509/t20150907_1452338.htm
- Munby, H. (1984). A qualitative approach to the study of a teacher's beliefs. *Journal of Research in Science Teaching*, 21, 27-38.
- Nunnally, J. C. (1978). *Psychometric theory* (2nd ed.). New York, NY: McGraw-Hill.
- Ogan-Bekiroglu, F., & Akkoc, H. (2009). Pre-service teachers' instructional beliefs and examination of consistency between beliefs and practices. *International Journal of Science and Mathematics Education*, 7, 1173-1199.
- Pajares, M. F. (1992). Teachers' beliefs and educational research: Cleaning up a messy construct. *Review of Educational Research*, 62(3), 307-332.
- Sahin, S., & Yilmaz, H. (2011). A confirmatory factor analysis of the Teaching and Learning Conceptions Questionnaire (TLCQ). *Journal of Instructional Psychology*, 38, 194-200.
- Sahlberg, P. (2010). The secret to Finland's success: Educating teachers. Stanford Center for Opportunity Policy in Education-Research Brief. Retrieved from <https://edpolicy.stanford.edu/sites/default/files/publications/secret-finland%E2%80%99s-success-educating-teachers.pdf>
- Schifter, D., Russell, D. J., & Bastable, V. (1999). Teaching to the big ideas. In Solomon, M. Z. (Ed.). *The diagnostic teacher: Constructing new ideas to professional development*. New York: Teachers College Press.
- Schommer, M. (1994). Synthesizing epistemological belief of research: tentative understandings and provocative confusions. *Educational Psychology Review*, 6(4), 293–319.
- Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15(2), 4–14.
- Steffe L. P., & D'Ambrosio, B. S. (1995). Toward a working model of constructivist teaching: A reaction to Simon. *Journal for Research in Mathematics Education*, 26(2), 146-159.
- Stipek, D. J., Givvin, K. B., Salmon, J. M., & MacGyvers, V. L. (2001). Teachers' beliefs and practices related to mathematics instruction. *Teaching and Teacher Education*, 17, 213-226.
- Strauss, A., & Corbin, J. (1998). *Basics of qualitative research: Techniques and procedures for developing grounded theory*. Thousand Oaks: Sage Publications.
- Thompson, A. G. (1984). The relationship of teachers' conceptions of mathematics and mathematics teaching instructional practice. *Educational Studies in Mathematics*, 15(2), 105-127.
- Villegas-Reimers, E. (2003). Teacher professional development: An international review of the literature. UNESCO: International Institute for Educational Planning. Retrieved from http://www.cndwebzine.hcp.ma/cnd_sii/IMG/pdf/HTTP__~4.PDF

Von Glasersfeld, E. (1989). Constructivism in education. In T. Husen & N. Postlethwaite (Eds.), *International encyclopedia in education (Supplementary Volume)*, pp. 162-163). Oxford, England: Pergamon.

Vygotsky, L. S. (1987). The development of scientific concepts in childhood. In R. W. Rieber & A. S. Carton (Eds.), *The collected works of L. S. Vygotsky. Volume 1. Problems of general psychology* (N. Minick, Trans) (pp. 167-241). New York, NY: Plenum.

Waite, A. M., & McDonald, K. S. (2019). Exploring Challenges and Solutions Facing STEM Careers in the 21st Century: A Human Resource Development Perspective. *Advances in Developing Human Resources*, 21(1), 3-15.

Wang, J., & Lin, E. (2005). Comparative studies on U.S. and Chinese mathematics learning and the implications for standards-based mathematics teaching reform. *Educational Researcher*, 34(5), 3-13.

Whitworth, B. A., & Chiu, J. L. (2015). Professional development and teacher change: The missing leadership link. *Journal of Science Teacher Education*, 26(2), 121-137.

Wood, T., Cobb, P., & Yackel, E. (1991). Change in teaching mathematics: A case study. *American Educational Research Journal*, 28(3), 587-616.

Woodbury, S., & Gess-Newsome, J. (2002). Overcoming the paradox of change without difference: A model of change in the arena of fundamental school reform. *Educational Policy*, 16(5), 763-782.

Wright, D. S., Balgopal, M. M., Sample McMeeking, L. B., & Weinberg, A. E. (2019). Developing Resilient K-12 STEM Teachers. *Advances in Developing Human Resources*, 21(1), 16-34.

Zhu, C., Valcke, M., & Schellens, T. (2008). A cross-cultural study of Chinese and Flemish university students: Do they differ in learning conceptions and approaches to learning? *Learning and Individual Differences*, 18, 120-127. doi:10.1016/j.lindif.2007.07.004

Appendix A

Sample Survey Questions

Teachers' conceptions of own learning					
I learn most from a study day when I am told exactly what it is about and what I should do	1	2	3	4	I learn the most from a study day when I have to find out and experience myself how it works
Teachers' conceptions of student learning					
It is the teachers' responsibility to evaluate the students' learning achievement	1	2	3	4	If students do not learn to evaluate their learning achievements, they have only learned half the lesson

Appendix B

Classroom Case Presented for the Structured Interview

In this case, Ms Lister, a geometry teacher, posed the following task to her students: "You take a piece of regular paper and you roll it this way, so that the 8.5 inch sides meet like this," Meanwhile, Ms Lister was rolling up a sheet of notebook paper so that the sides just met, with no overlap. "Then you take the same piece of paper and roll it the other way so that the 11 inch sides meet (see the following Figure). How will the volumes of the cylinders compare?"

When enacting this task with her students, Ms Lister insisted that her students solved the task in small groups independently. When students ran into difficulties, Ms Lister refrained from providing answers directly, but instead redirected students' thinking by posing guiding questions. One group of students made paper airplanes and were clearly off-task. Toward the end of the case, Ms Lister, called a struggling student, Lucy, to the board (e.g., a special education student in the English version, changed to "struggling" for Chinese preservice teachers; the change was made due to the differences in policies and practices regarding special education in the U.S. and China).

Despite the fact that Lucy made a mistake during her problem solving, Ms Lister guided Lucy through the process until Lucy successfully identified her mistake. The full text including a problem set is available in the casebook cited above.

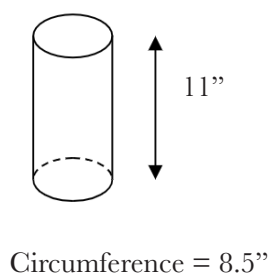
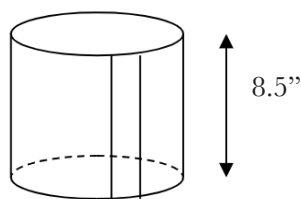


Table 2

Item mean scores, standard Deviations, one-sample t-tests, and factor loadings for conceptions of student learning (N = 129)

Statement on the left loading	Mean (SD)	Statement on the right	Factor
Factor 1: Individual versus social learning			
Co-operating is too distracting, learning is done best alone	2.68 (0.67)**	Students learn more by co-operating than they do when working on their own	0.728
When students discuss the subject matter together, they will not be any wiser in the long run	3.55 (0.71)***	When students discuss together, they learn to handle different points of view and acquire deeper insight	0.712
Students learn best when they work individually on the subject matter	2.93 (0.72)***	Students learn a lot from each other when they work together on the subject matter	0.688
When students co-operate, they often learn wrong things from each other	3.40(0.69)***	Students learn a lot by explaining things to each other	0.643
Factor 2: External versus internal regulation of knowledge construction			
Old-fashioned learning by rote is the most effective way to learn part of the subject that I teach	3.44 (0.61)***	Utilizing knowledge is not learned by memorizing lists and rules	0.718
It is important that students are kept informed about facts and have a thorough knowledge of them.	3.55 (0.65)***	It is important that students learn to think on their own and pass their own judgement	0.677
Learning will be the most successful when an expert is in charge	3.22 (0.74)***	Learning will be most successful as the students themselves take the initiative	0.644
It is the teachers' responsibility to evaluate the students' learning achievements	3.00 (0.88)***	If students do not learn to evaluate their learning achievements, they have only learned half the lesson	0.585
Factor 3: Fixed versus Dynamic Ability			
Mistakes and bad marks are bad news for students. We should handle these cautiously	2.88 (0.89)***	Mistakes and bad marks are not a problem in themselves, provided that you help students learn from them	0.492
In general, students are not able to work on their own	3.05 (0.65)***	Students are perfectly capable of working on their own	0.488
Some students cannot be expected to make much progress	3.02 (0.67)***	All students should be challenged to perform, even if they find this difficult	0.416
Bright students are already bright when they enter school	3.08 (0.84)***	The school's task is to help students to become brighter	0.429

Note: ** $p < .01$, *** $p < .001$ means are significantly higher than the neutral point (2.50)

Table 3

Item Mean Scores, Standard Deviations, One-Sample t-tests, and Factor Loadings for Conceptions of Own Learning (N = 129)

Statement on the left loading	Mean (SD)	Statement on the right	Factor
Factor 1: Social & lifelong learning versus individual & limited learning			
When you have had the right teacher training, you know what you should do	3.31 (0.75)***	I would like to see how my colleagues do it	0.748
It is not easy to discover who is right when opinions differ	3.43 (0.72)***	Different opinions make it possible to gain deeper insight	0.716
I do not believe that you learn a lot by discussing things with others	3.42 (0.69)***	You learn a lot by comparing your opinion with that of others	0.690
It is important that you know how certain problems should be solved	3.56 (0.62)***	You can learn a lot from how other people approach problems	0.624
You cannot teach old dogs new tricks	3.71 (0.60)***	You are never too old to learn	0.602
When you have worked a number of years, you are so experienced that you will not learn much more	3.81 (0.45)***	I think I will keep on learning during my career	0.447
Factor 2: Externally versus Internally Regulated Learning			
I learn most from a study day when I am told exactly what it is about and what I should do	3.64 (0.57)***	I learn most from a study day when I have to find out and experience myself how it works	0.697
I like to know beforehand what is in store for me	2.74 (0.90)**	I find it so boring when everything is always predictable	0.679
In order to learn something new, I prefer to follow a well-structured course given by an expert	3.14 (0.74)***	In order to learn something new, I prefer to make my own plan and work things out in my own way	0.649
I feel happiest when I can do my work in the manner that I am used to	2.98 (0.94)***	I like to try out new things, even if they are not always a success	0.605
I like it when students' questions show that they are doing their work as expected	2.93 (0.81)***	I like it when students ask unexpected, 'strange' questions	0.520
It makes no sense to me to explore problems that cannot be solved	2.84 (0.84)***	The most interesting problems are in fact those that cannot be solved	0.513
Factor 3: Knowledge as Fixed versus Knowledge as Actively Constructed			
The most important characteristic of an expert is their excellent control of knowledge and skill in their domain	2.54 (0.98)	The most important characteristic of an expert is their independent ability for further development in their domain	0.657
In the course of time, one learns more precisely how things work	2.65 (0.95)	In the course of time, one learns to view things from different points of view	0.547
Learning is getting answers	3.11 (0.89)***	Learning is asking questions	0.368
Some teachers will always make a mess of it	2.81 (0.86)***	You can learn to overcome a rookie's problem	0.625

Note: ** p < .01, *** p < .001 means are significantly higher than the neutral point (2.50)

Appendix C

Case-based Interview Questions

1. Do you think letting students discuss in small groups helps them understand this problem better? Why or why not? What class format would you adopt? Please explain your choice. (Intended Corresponding Dimension on the Learning Inventory: Social Learning and Self-Regulation/Internal Regulation)
2. Do you agree with Ms Lister's approach, which allowed students to make mistakes while discussing the problem with their peers without providing the correct solution up front? Why or why not? (Intended Corresponding Dimension on the Learning Inventory: Construct Character of Knowledge, Self-Regulation/Internal Regulation, and Tolerance of Uncertainty)
3. Would you treat students with learning disabilities (or difficulties) like Lucy the same way that Ms Lister treated her in this lesson? (Intended Corresponding Dimension on the Learning Inventory: Dynamic View of Ability)

Appendix D

Correlation Coefficients of Factors for Preservice Teachers' Conceptions of Student Learning with the Factors of their Conceptions of Own Learning (N = 129)

	SL			OL		
	ISL	EIRKC	FDA	SLLL	EIRL	KFAC
Conceptions of student learning (SL)						
ISL		.23**	.15	.34**	.22*	-.07
EIRK			.35**	.39**	.40**	.32**
FDA				.38**	.32**	.38**
Conceptions of own learning (OL)						
SLLL					.41**	.17
EIRL						.37**
KFAC						

Note. ISL = Individual versus Social Learning; EIRKC = External versus Internal Regulation of Knowledge Construction; FDA = Fixed versus Dynamic Ability; SLLLL = Social and Lifelong Learning versus Individual and Limited Learning; EIRL = Externally versus Internally Regulated Learning; KFAC = Knowledge as Fixed versus Actively Constructed.

ABOUT THE AUTHORS



Jie Ke

Dr. Jie Ke (jie.ke@jsums.edu) obtained her Ph.D. in Human Resource Development (HRD) from Texas A&M University and MBA from EDHEC in France. She is an associate professor of HRD in the College of Education and Human Development at Jackson State University. Her research interests include Chinese Human Resource Development/Management, Evaluation and Assessment, Women Leadership Development, Motivations and Needs of Adult Undergraduates, and Effectiveness of eLearning. She serves in the Board of Directors and as Co-chair of China SIG for Academy of Human Resource Development (AHRD). Dr. Ke is the Principle Investigator of two grants in improving learning of underrepresented adult undergraduates.

Millard Juetta Bingham

Dr. Millard J. Bingham earned his bachelor's degree in criminal justice from the University of Southern Mississippi (USM). He also received his master's degree and doctoral degree from USM. His master's degree is in adult education and his doctorate is in adult education with an emphasis in higher education administration. He has held leadership and administrative positions with the Mississippi State Personnel Board, the Mississippi Department of Education, and now presently at Jackson State University (JSU). Dr. Bingham currently serves as interim associate dean of the College of Education and Human Development and holds the rank of associate professor.



Rui Kang

Dr. Rui Kang is a Professor of Teacher Education in the College of Education at Georgia College & State University. Her scholarship focuses on mathematics teaching and learning, STEM education, teacher preparation and professional development, cognition and instruction, and curriculum development. Her recent publications appear in journals such as *Mathematics Teacher*, *International Journal of Science and Mathematics Education*, *School Science & Mathematics*, *Teacher Education & Practice*, and *The Journal of Social Studies Research*.

Di Liu

Dr. Di Liu is an Associate Professor in the Faculty of Education at East China Normal University. She teaches courses on teaching mathematics for elementary students and teaching mathematics for students with disabilities. Dr. Liu's research focuses on instructional methods to promote academic learning for students with autism and intellectual disability. She is currently working with undergraduate, master's, and doctoral students to develop and evaluate strategies for teaching meaningful mathematical skills.



Cybersecurity simulations and training pedagogy: a pilot study of applied learning outcomes

Michael Workman

Abstract

As educational technologies have advanced to allow real-world problems to be modelled in simulations, many of these are being incorporated into commercial and academic curricula. However, it has been unclear whether these approaches actually improve learning outcomes because few empirical studies have systematically tested the efficacy of various training methods and modes, and those that have been conducted have yielded inconsistent findings. Recent literature on the use of gamified simulations and live activities such as hackathons have suggested that they may improve applied cybersecurity behaviours. We conducted an exploratory study of these compared to a traditional classroom/laboratory approach to assess the applied behavioural contribution of each. We found that a combination of simulations with live activities in conjunction with classroom study produced the best outcomes.

Introduction

The state of the cybersecurity among democratic nations is grave, and there is little dispute regarding the need to significantly improve (Veksler, Buchler, Hoffman, Cassenti, & Sugrim, 2018). This need is present in many different verticals, but it is especially pressing within organizational and national critical infrastructure, where attackers are highly motivated and the consequences of failure may be catastrophic.

Due to the importance of the threats, obtaining access to information on cybersecurity matters is not particularly difficult. Bookstores, universities, and the Internet are overflowing with good advice and best practices. However, countermeasures are often not put into practice until after a problem has been discovered. We suffer not from ignorance of knowing what to do, but from a seeming inability or unwillingness to put the knowledge into practice. In other words, there is a significant knowing-doing gap (Workman,

Bommer & Straub, 2008). Consequently, cybersecurity training has become a focal point in both inculcation of new information and in refreshing awareness.

Yet in spite of its importance, few empirical studies have systemically tested the efficacy of various training methods and modes to determine their impacts on applied learning outcomes. The few studies that have been conducted have yielded inconsistent findings (Arthur, Bennett, Edens, & Bell, 2003; Thatcher & Perrewé, 2002; Veksler, et al., 2018). The typical pedagogy used in cybersecurity training involves a lecture followed by laboratory practice. There are two fundamental problems in this approach. First, the practice does not usually follow immediately from the topical learning. In order to change behaviours through reinforcement (in this case the practice) the practice must follow the learning (Baron, Perone & Galizio, 1991; Williams, Saunders & Perone, 2013). Second, this model lacks ecological validity because people apply their lab practice in synthetic and controlled environments (Rumeser & Emsley, 2018).

Recent literature on the use of gamified simulations (e.g. Jalali, Siegel & Madnick, 2019; Jin, Tu, Kim, Heffron, & White, 2018) have suggested that highly targeted learn-practice simulations carefully crafted to address the needs of a particular audience may present an opportunity for improving cybersecurity behaviours (i.e. doing better), leading to tangible improvements in the cybersecurity stance (Arthur, et al., 2003; Rumeser & Emsley, 2018).

Beyond gamified simulations, there has been speculation that “live-fire” exercises such as hackathons and capture the flag events may further improve learner capabilities (Ernits, Tammekänd, & Maennel, 2015). Moreover, a survey of the literature (e.g. Ernits et al., 2015; Hoffman, Rosenberg, Dodge, & Ragsdale, 2005; Schepens, Ragsdale, Surdu, Schafer, & New Port, 2002) shows both the need and the value of cybersecurity games and competitions that go beyond the typical cyber training

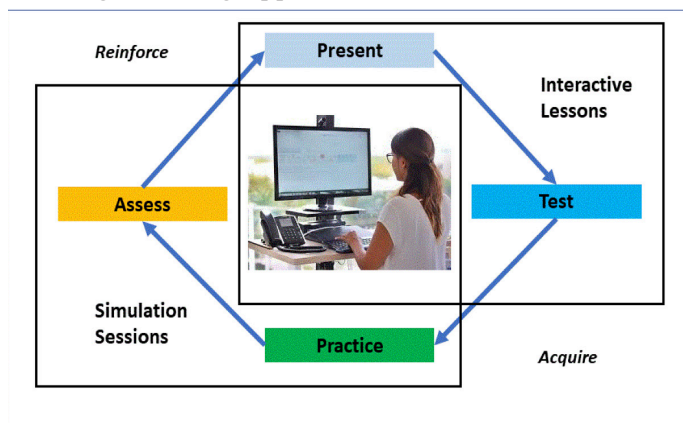
exercises and simulations, yet there have been few if any systematic tests of these propositions to our knowledge. Such a study could prove informative to the cybersecurity training literature, as simulations and competitive games have been shown to be effective in other areas such as identifying exploitable flaws in cyber infrastructure (Pan, Teixeira, López & Palensky, 2017).

tier-1 universities in the United States. This indicated the wide use of a dialectical-contextual social constructivism method in which classroom lectures and team-based tasks are paired with laboratory exercises. By most accounts, this approach has been shown to be effective for rote knowledge (Arthur, et al., 2003). The ability to learn and practice has demonstrated knowledge acquisition benefits

We suffer not from ignorance of knowing what to do, but from a seeming inability or unwillingness to put the knowledge into practice.

In addition, domain general studies on training effectiveness (e.g. Arthur, et al., 2003) have shown that learning occurs best when the training is targeted to a specific set of behaviours or skills, are situated in a context relevant to the learner, and are actionable. In other words, training and development that can be used immediately rather than merely instilling “head knowledge”. Given these findings, it is intuitive that a present-test-practice-assess (PTPA) approach should facilitate optimal learning-doing behaviours. This approach is seen in Figure 1.

Figure 1
Training/Learning Approach



To further inform the body of cybersecurity literature, we conducted a systematic test of three modes of cybersecurity education (classroom training, simulations, live-fire exercises), as well as examining their impacts on training efficacy. Our primary interest was to determine the contribution of each mode of learning on cybersecurity responses to factor into training evaluation and benefit analysis. What follows is our theoretical justification of hypotheses, an explanation of our study conditions and approaches, the results of our study, followed by a discussion and conclusions.

Theory and hypotheses

Instructional theory and design

The contemporary model for cybersecurity instruction is based on a lecture and laboratory approach (TeachThought, 2019). We surveyed the cybersecurity courses taught at fifty

(Ferdig, 2006; TeachThought, 2019). Because this is the most common in-use best practice learning model, we assumed this approach for our baseline comparative. This baseline course was predicated on education to drive behavioural change by incorporating the following features (Arthur et al., 2003; Conetta, 2019; Hoke, Reuter, Romeas, Montariol, Schnell, & Faubert 2017; Sitzmann & Weinhardt, 2019)

Materials must be targeted with participant learning characteristics in mind. Participants should have materials presented to them in a way that makes clear why poor cybersecurity practices will adversely affect their missions, allowing for different learner characteristics and cognitive styles. By contextualizing the security training materials, cybersecurity can become an important means to helping participants achieve their educational goals as well as fostering effective learning outcomes.

Materials must be experientially in context for the learner. Learning materials are not sufficient to change habituated behaviours unless they are incorporated into an environment or ecosystem in which the learner will actually apply the knowledge. The materials must present commonly used technologies that the learner will be likely to encounter in the field. The goal is to present enough material to drive meaningful behavioural change, but not so much that it is overwhelming. Importantly, it must consider that rare anomalous activities are hard for humans to detect (c.f. Hogan & Bell, 2009); and likewise, too much stimuli tend to be ignored as noise (Banks, 2007). Moreover, the instruction must also consider the Anderson (2000), Baldwin and Ford (1988) and Burke (1997) foundational understanding of learning/knowledge decay through scaffolding and continuous reinforcement. Knowledge decay is essentially forgetting over time due to lack of reinforcement and/or in situ practice.

Materials must be actionable. Corporate and governmental infrastructure such as transaction servers and power grids have both shared and unique characteristics. The approach must allow for the learning materials to drive learners toward simple but effective steps they can take immediately to improve the cybersecurity of all aspects of typical operations. These considerations include procedural knowledge as well as domain general and domain specific knowledge.

Simulation as learning augmentation

There is substantial anecdotal and some scientific evidence that simulations may augment procedural, declarative, and experiential cybersecurity knowledge and hence learning effectiveness (Jin, et al., 2018; Veksler, et al., 2018). Unfortunately, few studies have systematically tested this proposition (Voskoboinicov & Melnyk, 2018); however, there is strong theoretical justification to support it (e.g. Miranda, 2018). The few studies that have looked at various aspects of cybersecurity simulations on learning (e.g. Hendrix, Al-Sherbaz, & Bloom, 2016; Jalali et al., 2019, Jin et al., 2018; Landers & Armstrong, 2017; Miranda, 2018; Voskoboiniov & Melnyk, 2018) have provided partial insights into how simulations may be utilized to augment cybersecurity training. These studies, however, have not cut across learning modes to identify modal contributions to the learning outcomes.

Nevertheless, one way in which simulations are surmised to improve learning effectiveness is by motivating and engaging the learner, largely because they are animated with procedural challenges in a manner similar to a game - i.e. they are “gamified” (Reio & Wiswell, 2001). Beyond this, simulations facilitate learning effectiveness through reinforced encoding specificity, in which learners incorporate the situational environment along with the educational tasks (Trafton & Trickett, 2001).

Next, simulations have the ability to facilitate the connection of mental representations to the real-world environment (Miranda, 2018), which should improve performance and promote positive behavioural change relative to cybersecurity hygiene (Goode, Levy, Hovav, & Smith, 2018). Simulations can model the actual events in a safe environment, allowing experimentation and experiential conditioning (Veksler, et al., 2018). Moreover, they are surmised to enhance cognitive cueing and improve metacognitive awareness by prompting learners to reflect on their learning progress and allowing them to repeat material at critical junctures if needed (Arthur et al. 2003; Conetta, 2019). Therefore, H1. Cybersecurity simulations will improve applied learning performance compared to conventional classroom/lab study alone.

Live activity event as learning

Augmentation

A live activity such as a “hackathon” (or sometimes, live-fire-activity) or “capture the flag event” goes beyond simulation by placing the learner in active real-world situation in which participants compete to try to compromise and defend/remediate systems (Leune & Petrilli, 2017; Sommestad & Hallberg, 2012). Where simulations allow for reinforcement and elaborative rehearsal, a live activity “puts knowledge to the test” (Hoke et al., 2017; Sitzmann & Weinhardt, 2019). Participants learn the effectiveness of what they have learned by means of practical application and execution of what they know (Landers & Armstrong, 2017). In that sense, it is a reinforcing reciprocal learning process – it reinforces what works, and illuminates what

does not work (Hoke, et al., 2017).

Finally, unlike simulations, which are sequential, live activities are non-sequential in nature (Kirschner & Paas, 2001; Retalis & Skordalakis, 2001) requiring acute situational awareness and optimal behavioural habituation to respond effectively “on the fly” (Torkzadeh & Van Dyke, 2002). This mode of learning is surmised to link information to the activity, which augments knowledge scaffolding opportunities (Hoke, et al., 2017) and enhances the student’s ability to gather, organize, and integrate information in order to apply it (Landers & Armstrong, 2017).

As a result:

- H2. Live activities will improve applied learning performance compared to conventional classroom/lab study alone.
- H3. Live activities will improve applied learning performance compared to conventional classroom/lab study combined with simulations.

Method

Participants

209 undergraduate students at a top tier university in the United States in a computer science programme participated in this study. Students were randomly assigned to one of four sections of the cybersecurity course (described in more detail under Instrumentation). Course sections are separate classes on the same topic. Section 1 (lecture/lab) had 46 students, ages ranged from 20 to 23, seven were females. Section 2 (lecture/lab + simulation) had 53 students, ages ranged from 19 to 23, eight were females. Section 3 (lecture/lab + live activity) had 61 students, ages ranged from 20 to 25, 11 were females. Section 4 (lecture/lab + simulation + live activity) had 49 students, ages ranged from 21 to 23, nine were females.

An applied knowledge pre-test was given to all participants prior to commencement. The distribution of scores was even across all four sections, and there was no statistical difference in pre-test scores across the sections; hence we were confident to proceed with the analysis. However, since there were correlations and some variance, we took the further step of using pre-test scores as a control co-variate in the analysis.

Instrumentation

To address instruction variability, the same instructor taught all four sections, and the same textbook and core instruction was used in all four sections and employed educational best practices (as described earlier). The course assignments and exams were identical, and presentation materials were the same, except where noted below. The course content covered threats and countermeasures to be applied to a variety of non-specific cybersecurity threats to systems and applications. The materials also specifically covered the top ten cybersecurity attacks against web applications as outlined by the OWASP top ten vulnerabilities database (OWASP, 2020).

At crucial learning points during the presentation of the materials, students were prompted to respond to questions or suggest remediations to programming code, firewalls, open ports, and so forth. There were several group projects, and one group presentation. Laboratory exercises included working with IDS (host and network), threat modelling tools, network analysers, infrastructure monitors, log analysers, port scanners, penetration testers and vulnerability scanners, writing a cryptographic program and then running static and dynamic code analysers against their code.

Section 1 consisted solely of the classroom and laboratory work, along with quizzes from the textbook, a mid-term and a final examination. Section 2 replaced the textbook quizzes and with simulation challenges. The simulation had two parts, the first presented a series of scenarios; for example, it rendered a webpage with a login, then had the participants follow instructions to enter various kinds of information, such as to determine whether the page was vulnerable to a SQL Injection. The participants would then try to identify the vulnerable code and the correct remediation. The second part was a guided game in which participants would assume a role as attacker or defender (ultimately both) in which they would try to exploit or select a solution to remediate the vulnerabilities.

Figure 2
Sample Fixtures and Panes for Simulation



Section 3 replaced the textbook quizzes and with two live competitive activities. In the first, the environment incorporated the OWASP Mutillidae with modifications. Participants would take active roles in trying to compromise systems, while simultaneously striving to find and fix vulnerabilities. The second part added a detection element, and consisted of a platform with a simulated network, and attack modules that would carry out various kinds of attacks. Participants utilized tools they had worked with such as intrusion detection systems, monitors and so forth to identify the attack and take corrective actions. The attack/detection/remediation activity consisted of several

components. At a macro-scale, these included a simulation engine with selectable infrastructure templates; attack modules that executed a particular attack; an API set that would allow custom applications and attack modules; a database to store state and other information, a student monitoring system to track student accuracy and point allocations for competitions; and a set of open source monitoring tools that the student would use to identify the attack.

Figure 3
Sample Attack/Detection/Remediation Fixtures and Panes



Section 4 incorporated both the simulation and the live activity. At the end of the course for all four sections, students underwent an assessment. The assessment tested analytical and procedural skills, in other words, how well students identified vulnerabilities and took appropriate actions. This was done by two means. The first part involved timed case studies of attacks, countermeasures, and remediation. The case studies were based on real incidents, and presented all the facts but did not specify the flaw(s). The participant had to correctly identify the main vulnerability, and any additional issues. One case study, for instance, presented a problem in which an open-source Web Application Firewall (WAF) was misconfigured to allow too many permissions, violating the least-privilege principle. This was followed by a Server Side Request Forgery (SSRF) attack, and subsequent failures by humans-in-the-loop to notice the alarms from the monitors that signalled unusually large downloads from Amazon Web Services (AWS) S3 buckets. Case studies had clear and definable vulnerabilities and remediation solutions.

The second part of the assessment involved an applied lab in which participants had to scan systems, log files, routers, firewalls, and so forth, to find ten major vulnerabilities in a Web application and correctly remediate them. Five hundred points were allotted to this assessment, for which students received t-shirts and mugs, but were not included in the students' grades. The case studies were

worth half of the points with half allocated to the lab. These were used as the dependent variable performance scores in the analysis.

Results

After data screening and pretests, we were sufficiently confident in our analyses. The Muachly's test of sphericity was not significant ($\chi^2 = 3.22, p = .59$), which indicates that the correlation matrix was not significantly different from the identity matrix in the correlations among variables (Myers, Well & Lorch, 2010). This combined with a relatively large sample size, made us confident that the assumption of sphericity had not been violated. In support of continuing with the remaining analyses, the test for homogeneity of variances was validated because the scatter was relatively equal (Myers, et. al., 2010). Finally, given the correlations among pretest scores, we tested the group means using t-tests with Bonferroni, none of which were significant, therefore we determined that the groups were not statistically different from each other prior to training.

Table 1

Pretest Means and Pearson Correlations Among Groups Prior to Training
N = 209. *p < .05, **p < .01, ***p < .001

Study Condition	μ	σ	1	2	3
1 Classroom/labs	114.17	1.11	--		
2 Simulations	109.83	1.26	-0.64**	--	
3 Live activity	116.19	1.57	0.68**	0.62**	--
4 Simulations & activity	112.32	1.34	-0.6**	0.69**	-0.63**

Assured of the integrity of our data, we tested our hypotheses using multivariate analysis of covariance (MANCOVA). There was some variance, hence we used the pre-test scores as the covariate. We wanted to determine whether there were significant differences among the modes of training delivery on the applied performance outcome. The overall MANCOVA was significant ($F = 1.33, p < .000, r^2_{adj} = .76$) indicating that there were differences in the overall model. Since we posited that there would be applied performance differences based on training mode, hypotheses must be based on univariate results and not on the overall multivariate test, thus we conducted individual ANCOVA for the hypotheses.

Hypothesis 1 proposed that cybersecurity simulations ($\mu=301.11, \sigma = 0.26$) would improve applied learning performance compared to conventional classroom/lab study alone ($\mu= 233.19, \sigma = 0.34$). This hypothesis was supported ($F = 7.88, p < 0.00, \eta^2 = 0.29$). Hypothesis 2 stated that live activities ($\mu= 256.19, \sigma = 0.20$) would improve applied learning performance compared to

conventional classroom/lab study alone ($\mu= 233.19, \sigma = 0.84$). This hypothesis was not supported ($F = 1.88, p = 0.19, \eta^2 = 0.14$).

Finally, hypothesis 3 indicated that live activities combined with simulations and conventional classroom/lab study ($\mu=388.88, \sigma = 0.40$) would improve applied performance compared to conventional classroom/lab study alone ($\mu= 233.19, \sigma = 0.34$). This hypothesis was supported ($F = 11.29, p < 0.00, \eta^2 = 0.31$). In summary, cybersecurity simulations improved applied performance over classroom and lab instruction. Adding activities such as capture the flag and hackathons appear to add little benefit to the applied learning outcome, yet when combined with simulations, that combination yielded the greatest gains in applied learning performance.

Table 2

Post-test Means, F-Scores and Eta Squared for Hypotheses

Study Condition	μ	σ	F	η^2
Classroom/labs	233.19	0.34		
H1 Simulations	301.11	0.26	7.88***	0.29
H2 Live activity	256.19	0.84	1.88	0.14
H3 Simulations & activity	388.88	0.4	11.29***	0.31

N = 209. *p < .05, **p < .01, ***p < .001

Discussion and conclusions

A significant amount of work by the cybersecurity community has gone into providing the rationale for using gamified simulations and live activities such as hackathons and capture the flag competitions in cybersecurity education, but there have been few, if any, studies that have systematically compared these modes. Given that we conducted this at one educational institution, we classify this research as exploratory. However, we do provide strong evidence that modes of education and activities are significant in learning outcomes in cybersecurity, and that none of these modes are optimal in isolation. Furthermore, we have reviewed and summarized cybersecurity educational best practices, which should help to inform cybersecurity pedagogy.

Within the cybersecurity space, industry-accepted certification schemes, such as the CISSP and associated programmes (e.g., Dulaney, 2009; Tipton & Henry, 2007) already provide interested parties with a wealth of information related to information security. As an example, the Official (ISC)2 Guide to the CISSP CBK contains nearly 1,000 pages of study material. Despite this wealth of information, in practice, organizations typically suffer penetrations and compromises due to poor user behaviour or incorrectly managed systems. It is often the case that the system fails not because of ignorance on the part of the defender, but because basic, well-known steps

were not taken (Workman, et al., 2008). There remains a significant knowing-doing gap, as evidenced by rampant cybersecurity breaches that have recently taken place.

In our study, one of our core goals was, therefore, to suggest how to change the behaviour of participants, moving them toward actions that enhance cybersecurity. In the cybersecurity space, improving awareness of the principles of information assurance and moderating behaviours is often more important than presenting an overwhelming amount of information that is not put into practice. Beyond that, getting practitioners to habituate affirmative behaviours using best practice methods is clearly beneficial. Furthermore, as actual preventative steps change quickly, care must be taken to produce learning materials that are actionable, but that have a reasonable period of applicability before obsolescence.

Consequently, we sought to understand the actual state of the art of cybersecurity education and gain insight into neglected areas, and the approximate level of awareness and technical understanding of the issues. We wished to ensure that our curriculum was both complete and focused, aimed at changing core behaviours that would immediately bolster the stability of cyber infrastructure. In essence, we derived from our research that our educational philosophical approach should be: (1) to stimulate change in a reasonable number of behaviours, rather than to educate broadly and create no lasting benefits, and (2) imbue and reinforce learning through “live-fire” practice with realistic simulations.

Next, our goal from the research was to determine ways for “doing better”. Motivated students who understand the importance and applicability of the materials presented to them learn better. To this end, we suggest changing the traditional learning approach from the present-memorize-test model to a show-test-practice-assess model. Moreover, we introduced how incremental chunks of knowledge situated in real-world contexts, that is, gamified, may instil a sense of emotional and cognitive investment in the scenarios by the learner. With regard to commercial, civil, and governmental organizations, regardless of the size or sophistication of the entity, a programme that clearly but concisely communicates and experientially situates real threats posed to cyber infrastructure will help engage participants and aid knowledge retention and implementation. Most importantly, we argue that this approach will produce responsive actors who will apply their knowledge when it most counts.

Limitations and lessons learned from our study include the notion that the quantity of cybersecurity information available in books or articles, or online from researchers, companies, user groups, and blogs provide a virtual “firehose” of warnings and advice related to cybersecurity. Indeed, perhaps the largest problem is the overwhelming and untargeted raft of information available. Cybersecurity risks surround us, but there is little understanding on the part of users, technologists, and managers that links a particular behaviour to an undesirable outcome. For example, users who infect their machines often have no

idea of the source of infection, or the choices that led to it; they simply know something has gone wrong. This low-quality feedback mechanism has jaded users at all levels, and led to a laissez-faire approach to cybersecurity. Users know better, but threats are abstract, distant, and omnipresent, all at the same time, and this accounts for why people may know better but don’t do better (Workman, et al., 2008). We aimed to carefully articulate a pedagogical approach with material that can be personalized or will allow customization optimized for the learner using mixed-modes.

What our research also tells us is that electronic infrastructure is critical to the smooth and safe operation of all aspects of everyday operations. Attackers are well motivated, and do not approach problems the way most people typically expect, and smooth running is critical to businesses and individuals. Education should tie cybersecurity threats back to the system, using real examples, and illustrate how defenders should not “stovepipe” threats. Finally, it is important to realize that seemingly small behavioural changes by users, and how attackers can leverage small errors in operations, compromises many kinds and areas of systems that form the threat matrix and vectors to be considered in cybersecurity education.

In summary, while students often test well in cybersecurity courses based on rote memorization, they have struggled with applying their knowledge on the fly in more realistic settings. Simulations and activities in this study demonstrated an overall improvement in understanding not only what to do, but how to do it - when it comes to cybersecurity threat detection and problem remediation.

Finally, in contrast to materials that focus exclusively on managing cybersecurity or the more technical aspects of cybersecurity within an ecosystem, training materials at this level are challenging due to the massive range of environments we must consider – ranging from small companies to large corporations, and government infrastructure. It is tempting to provide a simple list of technical topics in a checklist, but doing so is actually a prime example of the wrong approach. Although topics such as secure remote access, patch management, change management, and the intersection of physical and cybersecurity are suitable for checklists, they simply fail to ignite behavioural change that is so needed in cybersecurity responsiveness. Immersion in an environment via simulations and live activities appear to us to be critical to applied learning performance.

Acknowledgements

I would like to thank the anonymous reviewers and editor for their helpful comments. I would also like to thank Checkmarx, Inc., and Secure Code Warrior for providing cybersecurity simulation software to use in this study.

References

- Anderson, J. R. (2000). *Learning and memory*, NY: John Wiley & Sons.
- Arthur, W., Bennett, W., Edens, P. S., & Bell, S. T. (2003). Effectiveness of training in organizations: A meta-analysis of design and evaluation features. *Journal of Applied Psychology*, *88*(2), 234-245.
- Baldwin, T. T., & Ford, J. K. (1988). Transfer of training: a review and directions for future research. *Personnel Psychology*, *41*, 63-105.
- Banks, B. (2007). Using behavior analysis algorithms to anticipate security threats before they impact mission critical operations. *IEEE Conference on Signal Detection and Behavior, AVSS'07, Sept 5-7*, 307-312.
- Baron, A., Perone, M., & Galizio, M. (1991). Analyzing the reinforcement process at the human level: Can application and behavioristic interpretation replace laboratory research? *Behavior Analyst* *14*, 95–105.
- Burke, L. A. (1997). Improving positive transfer: A test of relapse prevention training on transfer outcomes. *Human Resource Development Quarterly*, *8*(1), 115-126.
- Center for Strategic and International Studies (2017). *Securing Cyberspace for the 45th Presidency*. <https://www.csis.org/analysis/2017-global-forecast>.
- Conetta, C. (2019). Individual differences in cyber security. *McNair Research Journal*, *15*(4), 2-20.
- Dulaney, E. (2009). *CompTIA Security +*. Indianapolis, ID: Sybex.
- Ernits, M., Tammekänd, J., & Maennel, O. (2015). *A fully automated cyber defense competition for students*. In: Proceedings of the 2015 ACM Conference on Special Interest Group on Data Communication, SIGCOMM, New York, 113–114.
- Ferdig, R. E. (2006). Assessing technologies for teaching and learning: understanding the importance of technological pedagogical content knowledge. *British Journal of Educational Technology*, *37*(5), 749-760.
- Goode, J., Levy, Y., Hovav, A., & Smith, J. (2018). Expert assessment of organizational cybersecurity programs and development of vignettes to measure cybersecurity countermeasures awareness. *Online Journal of Applied Knowledge Management*, *6*(1), 67-80.
- Hendrix, M., Al-Sherbaz, A., & Bloom, V. (2016). Game based cyber security training: Are serious games suitable for cyber security training? *International Journal of Serious Games*, *3*(1), 53-61.
- Hoffman, L. J., Rosenberg, T., Dodge, R., & Ragsdale, D. (2005). Exploring a national cybersecurity exercise for universities. *IEEE Security & Privacy*, *3*(5), 27–33.
- Hogan, L. C., & Bell, M. (2009). A preliminary investigation of the reinforcement function of signal detections in simulated baggage screening: Further support for the vigilance reinforcement hypothesis. *Journal of Organizational Behavior Management*, *29*, 6-18.
- Hoke, J., Reuter, C., Romeas, T., Montariol, M., Schnell, T., & Faubert, J. (2017). *Perceptual-cognitive & physiological assessment of training effectiveness*. Proceedings from the Interservice/Industry Training, Simulation and Education Conference (I/ITSEC), Orlando, FL. 1-12.
- Jalali, M. S., Siegel, M., & Madnick, S. (2019). Decision-making and biases in cybersecurity capability development: Evidence from a simulation game experiment. *Journal of Strategic Information Systems*, *28*, 66-82.
- Jin, G., Tu, M., Kim, T. Heffron, J., & White, J. (2018). *Game based cybersecurity training for high school students*. Proceedings of the ACM, SIGCSE'18, February 21-24. Baltimore, MD., 68-73.
- Kirschner, P. A., & Paas, F. (2001). Web-enhanced higher education: a tower of Babel. *Computers in Human Behavior*, *17*, 347–353.
- Landers, R. N., & Armstrong, M. B. (2017). Enhancing instructional outcomes with gamification: An empirical test of the technology-enhanced training effectiveness model. *Computers in Human Behavior*, *71*, 499-507.
- Leune, K., & Petrilli, S. J. (2017). *Using capture-the-flag to enhance the effectiveness of cybersecurity education*. Proceedings of the ACM, SIGITE'17, October 4–7. Rochester, NY, 47-52.
- Miranda, M. J. A. (2018). Enhancing cybersecurity awareness training: A comprehensive phishing exercise approach. *International Management Review*, *14*(2), 5-10.
- Myers, J. L., Well, A. D., & Lorch, R. F. (2010). *Research design and statistical analysis*. NY: Rourledge.
- OWASP (2020). *OWASP.org top 10 web attacks*. <https://owasp.org/www-project-top-ten/>
- Pan, K., Teixeira, A., López C. D., & Palensky, P. (2017). *Co-simulation for cyber security analysis: Data attacks against energy management system*. Proceedings from the IEEE International Conference on Smart Grid Communications (SmartGridComm), Dresden, Germany, 253-258.
- Reio, T. G., & Wiswell, A. (2001). Field investigation of the relationship among adult curiosity, workplace learning, and job performance. *Human Resource Development Quarterly*, *11*(1), 5-30.
- Retalis, S., & Skordalakis, E. (2001). CADMOS: an approach to developing web-based instructional systems. *Computers in Human Behavior*, *17*, 393–407.
- Rumeser D., & Emsley, M. (2018). A systematic review of project management serious games: Identifying gaps, trends, and directions for future research. *The Journal of Modern Project Management*, *6*(1), 33-44.

- Schepens, W. J., Ragsdale, D. J., Surdu, J. R., Schafer, J., & New Port, R. (2002). The cyber defense exercise: an evaluation of the effectiveness of information assurance education. *Journal of Information Security*, 1(2), 118-127.
- Sitzmann, T., & Weinhardt, J. M. (2019). Approaching evaluation from a multilevel perspective: A comprehensive analysis of the indicators of training effectiveness, *Human Resource Management Review*, 29(2), 253-269.
- Sommestad, T., & Hallberg, J. (2012). *Cyber security exercises and competitions as a platform for cyber security experiments*. In A. Jøsang and B. Carlsson (Eds.): *NordSec 2012, LNCS 7617*, pp. 47–60, Springer-Verlag Berlin Heidelberg.
- TeachThought (2019). *Modern trends in education: 50 different approaches to learning* <https://www.teachthought.com/pedagogy/modern-trends-education-50-different-approaches-learning/>.
- Thatcher, J. B., & Perrewé, P. L. (2002). An empirical examination of individual traits as antecedents to computer anxiety and computer self-efficacy. *MIS Quarterly*, 26(4), 381–396.
- Tipton, H. F. & Henry, K. (2007). Official (ISC)2 Guide to the CISSP CBK. NY: Auerbach.
- Torkzadeh, G., & Van Dyke, T. P. (2002). Effects of training on internet self-efficacy and computer attitudes. *Computers in Human Behavior*, 18, 479–494.
- Trafton, G. J., & Trickett, S. B. (2001). Note-taking for self-explanation and problem solving. *Human-Computer Interaction*, 16, 1–38.
- Veksler, V. D., Buchler, N., Hoffman, B. E., Cassenti, D. N., & Sugrim, S. (2018). Simulations in cyber-security: A review of cognitive modeling of network attackers, defenders, and users. *Frontiers In Psychology*, 9, 1-12.
- Voskoboincov, S. & Melnyk, S. (2018). Cyber security in the modern socation and improvement of preparation of future factors in the field of competent approach, *Social Work and Education*, 5(1), 103-112.
- Williams, D. C., Saunders, K. J., & Perone, M. (2013). Extended pausing by humans on multiple fixed-ratio schedules with varied reinforcer magnitude and response requirements. *Journal of Experimental Analysis of Behavior*, 95(2), 203-220.
- Workman, M., Bommer, W. H., & Straub, D. (2008). Security lapses and the omission of information security measures: An empirical test of the threat control model, *Computers in Human Behavior*, 24, 2799–2816.

ABOUT THE AUTHOR



Michael Workman

Michael Workman has over 15 years of experience as an academic, and more than 25 years as a technology management professional. His Ph.D. is from Georgia State University with post-doctoral at the University of Florida. Michael was a professor of information science at Florida State University, and is currently a professor of technology management at Texas A&M University. Michael has successfully managed virtual teams, departments of over 500 people, budgets over \$50 million, and people located globally (Montreal; London; Paris, Lyon, Sophia Antipolis/Nice FR), with a track record for on-schedule and in-budget delivery of high quality, in-demand products used around the world (commercial revenues in excess of \$1 billion). Michael worked at the Security Policy Institute (SPI)/Modus Operandi as a research scientist on classified cybersecurity R&D, particularly in intelligence, surveillance, and reconnaissance (ISR) fusion for the US and NATO military and intelligence communities. Michael has published over 50 research manuscripts, four textbooks, and has worked on millions of dollars in research grants. He has been a fellow of the L3Harris Institute of Information Assurance, has been the Director of North/Central Florida Software Process Improvement Network (SPIN), and has been a member of the NSA/DHS Cybersecurity Centers of Academic Excellence.

Attraction of qualified people: digitalization as opportunity

Angélica Souza, Marlene Amorim, Marta Ferreira Dias, Liliana Baptista & Rui Lopes

Abstract

The regions of Portugal need to develop strategies that can equip them with skilled workers, who will be part of the implementation and development of digital transformation. This will be particularly vital for small and medium-sized enterprises and medium-sized urban areas. Both intensely need skilled digital talent but have limited means to train or attract a work force ready to work. This study offers innovative insights into what factors can attract the human capital needed for sustainable regional development and growth in medium-density urban regions, taking the Aveiro region as an example. The data was collected through questionnaires and interviews aimed at visitors, exhibitors, and staff of the 'Techdays' event. Knowledge of the challenges and opportunities of the digitization process is extremely important, as, if not adequately addressed by local and national authorities, the digital adoption of intelligent and connected technologies will tend to perpetuate inequalities already existing within a region. In order to clarify the implications of these challenges, it is necessary to rethink the region's adequacy in attracting and retaining qualified people in the context of the digital transformation of the region's production and economy.

Introduction

The main objective of this study is to investigate what qualified people value in a place to live and, moreover, what aspects they consider when they are looking for a job. This theme has already been addressed in the literature. However, this research brings novelty because it considers qualified personnel in the area of ICTE (information, communication, technology, and electronics). We had the opportunity to interview people visiting the Aveiro exhibition park from 10th to 12th October 2019 for the Techdays event. This was the fifth such event for an audience interested in digital technologies and included conferences, exhibitions, business meetings, education promotion activities, in particular STEAM (Science, Technology, Engineering, Arts, and Maths) and other activities. The Techdays event gives opportunities to

demonstrate development and testing and for sharing the skills needed for digital processes.

The paper uses an online survey to collect the data, with one to one contact used to explain the study objectives to people who showed interest. The survey could be completed online, but also on paper at the site if preferred by the interviewee.

It is useful for technology companies and the region as a whole to understand whether the aspects that people value in the choice of the region to live and work are in accordance with those that the region offers. Moreover, whether or not it should make changes in order to follow these aspirations. Some previous studies show that for a region to be attractive, it should not only offer good job opportunities but also offer leisure activities and good infrastructure, that is, quality of life (Pilati & Tremblay, 2007; Servillo, Atkinson, & Russo, 2012).

Need for skilled labour for the regions

Darchen and Tremblay (2010) examined the influence of criteria, related to the quality of the place and career opportunities, on the mobility of science and technology students joining the profession. They concluded that the qualities of the place are less important than career opportunities for these individuals. For Pilati and Tremblay (2007) factors considered attractive include: cultural diversity, welcoming environment, safety, quality of life, lifestyle, social or more subjective work rhythm, housing cost, urban density, spaces with natural features, public transport, cleanliness, climate, and location. Zenker, Petersen and Aholt (2013) address the concept of Citizen Satisfaction Index (CSI) comprising four distinct dimensions of citizen satisfaction:

- Urbanization and diversity (cultural activities, variety of shopping opportunities; many different cultures; availability of different services; urban image; openness and tolerance of the city, etc.),
- Nature and recreation (public green areas; environmental quality; several parks and open spaces;

outdoor activities; tranquility of the place),

- Employment opportunities (general level of wages; good job opportunities and promotion; economic growth of the region in particular; professional networks in the city), and
- Cost efficiency (real estate market/cost of hiring; the general level of prices in the city / cost of living, availability of apartments and houses).

These four dimensions establish a conceptual structure of relevant factors that may be useful in comparative research on citizen satisfaction (Zenker et al., 2013). Servillo, Atkinson and Russo (2012) present the concept of territorial attractiveness as a powerful element in politics that allows regional development strategies to be more integrated under a general objective of territorial cohesion, considering its implications in terms of human mobility.

Given the importance of information technology professionals in the high-tech business environment, the question of how to attract and retain these professionals deserves special attention, as it is one of the challenging problems faced by corporate leaders (Agyeman & Ponniah, 2014). Therefore, the need to develop effective retention strategies arises, such as rewarding employee talent, increasing job satisfaction, providing a good working environment, career development opportunities, increasing recognition, etc. so that the problem of turnover is minimized (Agyeman & Ponniah, 2014). The study by SamGnanakkan (2010) measured the role of organizational commitment in human resources practice and in the intention of turnover among ICT professionals. He concludes that highly qualified professionals should not be managed as productive resources, but should rather be considered as human beings with specific needs and interests, that is, they must receive fair rewards, opportunities to learn and innovate, achieve new levels of responsibility and power. The ICT sector needs to reinforce the sense of self-esteem of highly qualified professionals: treating them as intellectual assets (not as expenses),



trusting them, and supporting their career experiences. In this way, they will be able to gain a competitive advantage by maintaining their human capital and the experience they already have (SamGnanakkan, 2010). Maxwell and Knox (2009) identified four categories of attributes that employees consider most attractive:

- employment (employee rewards, management style, relationships between manager and workforce, work environment, workforce attributes),
- organizational success,
- interpreted external image, and
- product or service attributes.

Relevant factors in choosing a place to live and aspects valued in a job

Considering the literature and motivation above, two main questions were created: What factors do you consider relevant in choosing a region to live? What aspects do you value in a job?

Identified variables

The demographic variables in the survey were: gender, age, level of qualification (Agyeman & Ponniah, 2014; Bussin & Brigman, 2019), profession, whether they have children (Carlotto, Wendt, & Jones, 2017b) and district of residence (Darchen & Tremblay, 2010). All these variables are very important for the characterization of human resources.

The first question had 14 variables that include urban, diversity aspects, nature, recreational activities, employment opportunities, and costs. The variables asked and studied are given in Table 1.

Table 1

Variables of Regional Attractiveness

Cost of living, job opportunities, and services	Darchen & Tremblay (2010); Servillo et al. (2012)
Housing and population density, public transport, environmental quality, leisure	Pilati & Tremblay (2007)
Accessibility and infrastructure, climate	Servillo et al. (2012)
Culture/art, security	Darchen & Tremblay (2010); Pilati & Tremblay (2007); Servillo et al. (2012)
Proximity to beaches	Buch, Hamann, Niebuhr, & Rossen (2014)

The second question had 13 employment-related variables including working conditions, wage level, work-life balance, etc. The variables selected are given in Table 2,

Table 2
Employment Variables

Salary	Darchen & Tremblay (2010); Servillo et al. (2012)
Awards	Agyeman & Ponniah (2014), R. Maxwell & Knox, (2009); Sam Gnanakkan (2010)
Career development opportunities	Agyeman & Ponniah (2014); Sam Gnanakkan, (2010)
Education/training	Carayon, Schoepke, Hoonakker, Haims, & Brunette (2006); Sam Gnanakkan (2010)
Working team	Agyeman & Ponniah (2014); Maxwell & Knox, (2009); Van der Heijde et al. (2018)
Evaluation system	Van der Heijde et al. (2018)
Supervision support	Agyeman & Ponniah (2014); Van der Heijde et al. (2018)
Management efficiency	Maxwell & Knox (2009); Sam Gnanakkan (2010)
Internal communication	Agyeman & Ponniah (2014); Sam Gnanakkan, (2010)
Flexible schedules	Nolan (2018)
Infrastructure quality	Greenan & Messe (2018)
Challenge	Carayon et al. (2006)
Work-life balance	Carayon et al. (2006); Carlotto, Wendt, & Jones (2017a)

Methodology

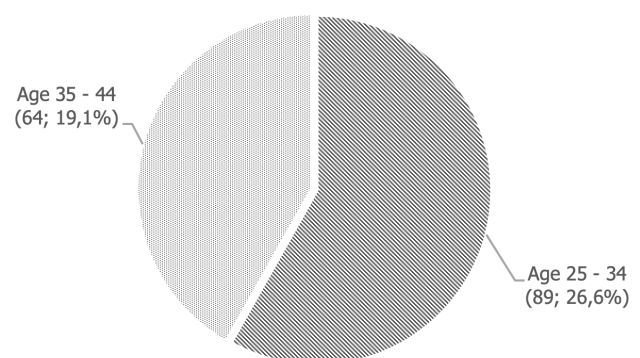
This article discusses the results of an exploratory study to identify and contribute to understanding the key attractiveness factors of a region and the perception of what people value at work, as well as the key amenities that are crucial to their decision to work at home. The study involved the application of questionnaires and interviews to people who attended the Techdays technology fair, an event that took place in the city of Aveiro in October 2019. The fair aims to share and disseminate technologies and offers conferences, exhibitions, performances, and other experiences to visitors interested in innovation and digitization. The 335 responses obtained via online and face-to-face interview were collected. The Type-Likert

scale was used to classify the responses, which were divided as follows: 1 (not relevant), 2 (not so relevant), 3 (relevant), 4 (very relevant) for factors that people find attractive in regions and what they value most at work. Specifically, the question “How often do you think about leaving / saying goodbye to your current job” used Likert's snap: 1 (never), 2 (rarely), 3 (sometimes), 4 (often) and 5 (always). This last question along with others measures the level of appreciation people have for their current job.

Sample characterization

Among the 335 questionnaires collected, it was possible to count the responses of 154 (46%) females and 181 (54%) males. Regarding the level of study completed, the sample ranged from 15 (4.5%) who had completed primary education, 47 (14%) who had completed secondary education, 121 (36.1%) participants were graduates, 122 (36, 4%) masters, and 30 (9%) have a doctorate. The age of the participants ranged from 91 (27.2%) people under 25, 89 (26.6%) people aged 25 to 34, 64 (19.1%) people aged 35 to 44, 54 (16.1%) people aged 45 to 54, and 37 (11%) people over 55. For interpretation purposes, the sample was divided into two groups (see Figure 1). The first group comprises people aged between 25 and 34 (N = 89; P = 26.6%) and the second group comprises people aged 35 to 44 (N = 64; P = 19, 1%). This division was mainly motivated by the need for a better understanding of youngsters who are entering the job market or are in the early years of their career.

Figure 1
Age of respondents



Statistical analysis

Version 25 of the Statistical Package for the Social Sciences (SPSS) IT software was used to meet the necessary requirements regarding descriptive statistical inference. Statistical inferences using parametric tests consisted of student tests with independent samples to compare among the two groups (Pallant, 2007).

Results

Attractiveness of the region, according to the age groups

According to the results, the main aspect that influences the choice for a given region to work is the “security” (M=3,77; SD=0,489), “infrastructure” (M=3,65; SD=0,541), “employment opportunities” (M=3,64; SD=0,576), “habitation” (M=3,56; SD=0,596), “environmental quality” (M=3,39; SD; 0,729), “cost of living” (M=3,36; SD=0,649), “accessibility” (M=3,29; SD=0,653), “public transport” (M=3,16; SD=0,800), “leisure” (M=3,11; SD=0,734), “services” (M=3,08; SD=0,696), “culture” (M=2,97; SD=0,802), “climate” (M=2,88; SD=0,832), “proximity to beaches” (M=2,51; SD=0,978), “population density” (M=2,40; SD=0,844).

When we want to evaluate which aspects are most valued by the different groups (see Figure 2), the results suggest that the importance given to the vast majority of aspects is similar between the age groups. However, it is possible to find some differences between the aspects “population density”, “infrastructure”, “environmental quality”, “climate” and “culture” for which the respondents aged 25 to 34 attributed higher relevance than the respondents aged 35 to 44.

Characteristics of the employment

The respondents were also asked to express their perceptions of the characteristics they valued in an employment. The questionnaire offered a list of characteristics, including aspects about the salary, the career development opportunities, etc. and asked respondents to express their perceptions as a level of relevance.

The results present some differences for the level of relevance between the 25 to 34 age group and the 35 to 44 age group (see Figure 3). Respondents in the 35 to 44 age group show greater relevance for some factors such as "evaluation system" (M=3.91; SD=0.771), "work-life balance" (M=3,78; SD=0,427), "reward for performance" (M=3.48; SD=0.591) and "flexible hours" (M=3.41; SD=0.886). Participants in the 25 to 34 age group show greater relevance for the factors "infrastructure quality" (M=3.25; SD=0.695), "management efficiency" (M=3.46; SD=0.692) and "supervision support" (M=3.04; SD=0.706). There were no significant differences for “salary”, “team-work”, “training/education” and “challenges” factors.

Concerning the appreciation for the respondents' current job, two different parameters were evaluated - "Satisfaction with current job" and "How often do you think about quitting your job". A Pearson correlation test was performed to measure the existence of a linear correlation between these two parameters. Through this test, we have the intensity of a linear relationship between two datasets.

Figure 2
Most relevant aspects for the attractiveness of a region

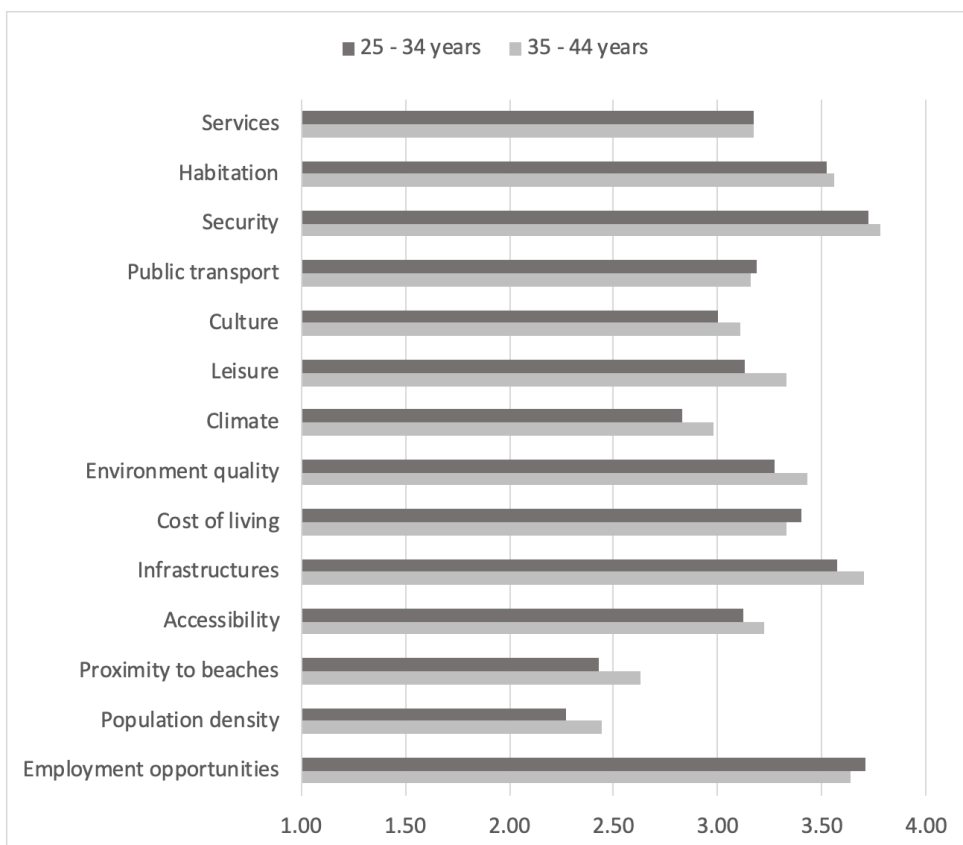


Figure 3
Characteristics of the employment

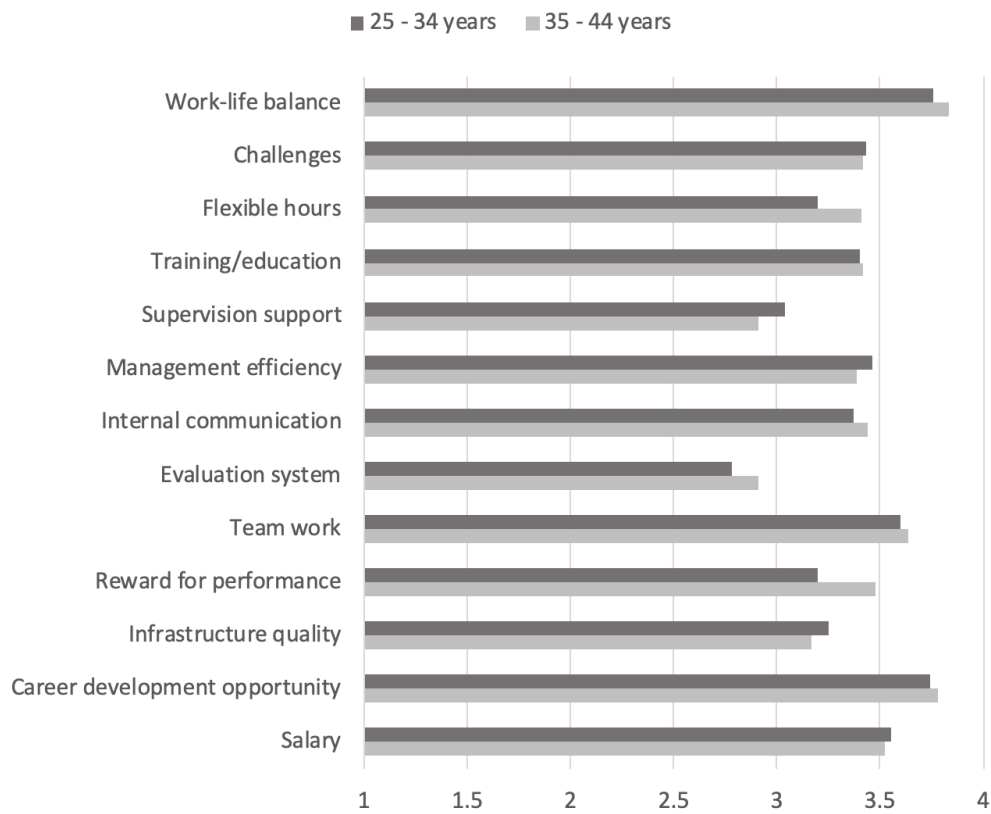


Table 3
Correlation between age and current job appreciation

		Age	Satisfaction with current job	How often do you think about quitting
Age	Pearson Correlation	1	-0.018	0.06
	Sig. (2-tailed)		0.779	0.342
	N	335	253	253
Satisfaction with current job	Pearson Correlation	-0.018	1	0.145*
	Sig. (2-tailed)	0.779		0.021
	N	253	253	253
How often do you think about quitting	Pearson Correlation	0.06	0.145*	1
	Sig. (2-tailed)	0.342	0.021	
	N	253	253	253

*Correlation is significant at the 0.05 level (2-tailed)

In order to perform the test, it was necessary to adjust the statistical normalization of the Type-Likert scales, the question "Satisfaction with current job" had the following scales 1 (not satisfied), 2 (low satisfaction), 3 (satisfied), 4 (very satisfied), after normalization the following equivalence were given 0 (not satisfied), 0.33 (low satisfaction), 0.66 (satisfied), 1 (very satisfied). The question "How often do you think about quitting your job" had the scale 1 (never), 2 (rarely), 3 (sometimes), 4 (often) and 5 (always), which was transformed to the following equivalence 0 (never), 0.25 (rarely), 0.5 (sometimes), 0.75 (often) and 1 (always) (Pallant, 2007).

The results show that there are few existing correlations (see Table 3). There is only one significant correlation that occurs between "Satisfaction with current job" and "How often do you think about quitting your job", with a low degree of significance (0.05 or less). The greater the dissatisfaction with the job, the more often you think about quitting that job. This result is consistent with the literature and with reality as we know it.

Conclusions

This study offers some insights into the attractiveness of regions from the perspective of technology professionals and stakeholders. The aim of the study is to contribute to understanding the determinants of talent attraction and retention, especially for areas of low density such as the Aveiro Region, and with digital transformation concerns. The results of this research are timely and relevant to inform policy makers about the challenges of attracting highly skilled work and talent, considered crucial to the sustainability of digital transformation in industries and regions. The results are aligned with other research and with the success factors of a region beyond the mere offer of a generous salary that encompass a constellation of variables related to individuals' quality of life and work. The study approached a sample of people in transition into the labour market or in the first years of their career. This is a representative sample since they have greater job opportunities and are more motivated for mobility. Results show that safety is a factor in job choices and professional life decisions. By comparing the age groups 25 to 34 and 35 to 44, we may conclude that we cannot demonstrate a very significant difference in the broader motivations for framing specific decisions to choose a region to work in. When we look at the attractive features in a job, we can see that people in the second group (35 to 44) have diverse preferences because they mention a number of different factors to support their decisions including "work-life balance", "flexible hours", "training/education", "internal communication", "evaluation system", "team work", "reward for performance", and "career development opportunity". The greater appreciation of attractive factors in the work of this group may be explained by the fact that most of the time these people are already part of the labour market.

These results and conclusions are important in understanding the determinants of people's reasoning

and decision-making related to their work and mobility options, especially in the context of digital transformation. For a region that asks for highly skilled workers, human resources need to be aware of what type of workers they want to attract, and it is crucial to know and understand which factors favour attraction and/or repulsion. Local government should be able to continue investing in features that attract people and act to alter features that make people leave. They can, together with the private sector, offer quality opportunities and make those opportunities reach everyone. All of these policies are particularly important in the case of a region that is undergoing a digitization process that is profoundly transforming industries and placing important demands on the provision of highly skilled workers. Therefore, our conclusions can be used to align corporate strategies and public policies in order to generate greater efficiency and success in the pursuit of sustainable growth in a medium-density urban region.

Acknowledgements

This work has been, in part, financially supported by the Research Unit on Governance, Competitiveness and Public Policy - GOVCOPP (project POCI-01-0145-FEDER-008540), funded by ERDF funds through COMPETE2020 - Programa Operacional Competitividade e Internacionalização (POCI) – and by national funds through FCT - Fundação para a Ciência e a Tecnologia. Any persistent errors or missing details are the authors' responsibility.

This study contributes to the Aveiro STEAM City project. The project "Aveiro STEAM City" is led by the Municipality of Aveiro and has the following investing partners: University of Aveiro, Altice Labs, Institute of Telecommunications, INOVARIA and CEDES. This project is co-financed by the Regional Development Fund - ERDF through the "Urban Innovative Actions" program and has a global investment of € 6,115,915, with ERDF support of € 4,892,732.



References

- Agyeman, C. M., & Ponniah, V. M. (2014). Employee Demographic Characteristics and Their Effects on Turnover and Retention in MSMEs. *International Journal of Recent Advances in Organizational Behaviour and Decision Sciences (IJRAOB) An Online International Monthly Journal*, 1(1), 2311–3197.
- Buch, T., Hamann, S., Niebuhr, A., & Rossen, A. (2014). What Makes Cities Attractive? The Determinants of Urban Labour Migration in Germany. *Urban Studies*, 51(9), 1960–1978. <https://doi.org/10.1177/0042098013499796>
- Bussin, M. H. R., & Brigman, N. (2019). Evaluation of remuneration preferences of knowledge workers. *SA Journal of Human Resource Management*, 17, 1–10. <https://doi.org/10.4102/sajhrm.v17i0.1075>
- Carayon, P., Schoepke, J., Hoonakker, P. L. T., Haims, M. C., & Brunette, M. (2006). Evaluating causes and consequences of turnover intention among IT workers: The development of a questionnaire survey. *Behaviour and Information Technology*, 25(5), 381–397. <https://doi.org/10.1080/01449290500102144>
- Carlotto, M.-S., Wendt, G. W., & Jones, A. P. (2017). Technostress, Career Commitment, Satisfaction with Life, and Work-Family Interaction Among Workers in Information and Communication Technologies. *Actualidades En Psicología*, 31(122), 91–102. <https://doi.org/10.15517/ap.v31i122.22729>
- Carlotto, M. S., Wendt, G. W., & Jones, A. P. (2017). Tecno-estrés, compromiso con la carrera, satisfacción con la vida y la interacción trabajo-familia en trabajadores de la información y tecnologías de la comunicación. *Actualidades En Psicología*, 31(122), 91. <https://doi.org/10.15517/ap.v31i122.22729>
- Darchen, S., & Tremblay, D. G. (2010). What attracts and retains knowledge workers/students: The quality of place or career opportunities? The cases of Montreal and Ottawa. *Cities*, 27(4), 225–233. <https://doi.org/10.1016/j.cities.2009.12.009>
- Greenan, N., & Messe, P.-J. (2018). Transmission of vocational skills in the second part of careers: the effect of ICT and management changes. *Journal for Labour Market Research*, 52(1), 0–16. <https://doi.org/10.1186/s12651-018-0240>
- Maxwell, G., Scott, B., Macfarlane, D., & Williamson, E. (2010). Employers as stakeholders in postgraduate employability skills development. *The International Journal of Management Education*, 8(2), 1–22. <https://doi.org/10.3794/ijme.82.267>
- Maxwell, R., & Knox, S. (2009). Motivating employees to “live the brand”: A comparative case study of employer brand attractiveness within the firm. *Journal of Marketing Management*, 25(9–10), 893–907. <https://doi.org/10.1362/026725709X479282>
- Nolan, P. (2018). Good Work: The Taylor Review of Modern Working Practices. *Industrial Relations Journal*, 49(5–6), 400–402. <https://doi.org/10.1111/irj.12239>
- Pallant, J. (2007). *SPSS Survival Manual A step by step guide to data analysis using SPSS for Windows* (Third Edit). New York: McGraw-Hill.
- Pilati, T., & Tremblay, D. (2007). Le développement socio-économique de Montréal: la cité créative et la carrière artistique comme facteurs d’attraction? *Canadian Journal of Regional Science*, 3, 475–496.
- SamGnanakkan, S. (2010). Mediating Role of Organizational Commitment on HR Practices and Turnover Intention among ICT Professionals. *Journal of Management Research*, 10(1), 39–61.
- Servillo, L., Atkinson, R., & Russo, A. P. (2012). Territorial attractiveness in EU urban and spatial policy: A critical review and future research agenda. *European Urban and Regional Studies*, 19(4), 349–365. <https://doi.org/10.1177/0969776411430289>
- Van der Heijde, C. M., Van der Heijden, B. I. J. M., Scholarios, D., Bozionelos, N., Mikkelsen, A., Epitropaki, O., ... Looise, J. C. (2018). Learning climate perceptions as a determinant of employability: An empirical study among European ICT professionals. *Frontiers in Psychology*, 9(DEC). <https://doi.org/10.3389/fpsyg.2018.02471>
- Zenker, S., Petersen, S., & Aholt, A. (2013). The Citizen Satisfaction Index (CSI): Evidence for a four basic factor model in a German sample. *Cities*, 31, 156–164. <https://doi.org/10.1016/j.cities.2012.02.006>

About the authors



Angélica Souza

Angélica Souza is a researcher and Master's student at University of Aveiro, Portugal. Angélica conducts research in the topics of job market, employability, regional competitiveness and digital transformation of jobs and territories. Angélica is a member of the research team in the project Aveiro STEAM City, an EU URBACT project, devoted to the digital transformation of work and life contexts.

Marlene Amorim

Marlene Amorim is Professor at the Department of Economics, Management, Industrial Engineering and Tourism at the University of Aveiro, Portugal and a member of the Research Unit in Governance Competitiveness and Public Policies (GOVCOPP). She served the University as Pro-rector for Internationalization from 2014 to 2018, and as Director and then Vice-Director for the Master in Industrial Engineering and Management. Currently she serves as Coordinator for the research line in Competitiveness Innovation and Public Policies at GOVCOPP. Marlene received her PhD in Management from IESE Business School of University of Navarra in Spain, and conducts research in the area of service systems, operations, innovation and quality.



Marta Ferreira Dias

Marta Ferreira Dias has a PhD in Economics from the University of Warwick, UK, a MSc in Economics from the University of Coimbra and a degree in Economics from the University of Coimbra. She is an Assistant Professor in the University of Aveiro, at the Department of Economics, Management, Industrial Engineering and Tourism. She is a member of the research unit on Governance, Competitiveness and Public Policies (GOVCOPP). She is a member of research teams of the University of Aveiro participating in several European sponsored projects in the fields of Social Economy and Competences for graduates. She is at the present Director of the PhD in Energy Systems and Climate Change in the University of Aveiro.



Liliana Baptista

Liliana Baptista is a researcher and Master's student at University of Aveiro, Portugal. Liliana conducts research in the topics of territorial competitiveness, notably focusing on talent attraction and retention at regional level. Liliana cooperates regularly with local stakeholders and entities in the development of studies to assess regional competitiveness and sustainability, to inform policy agendas and local practice.

Rui Lopes

Rui Lopes is a PhD student at University of Aveiro, Portugal. Holding a background in computer science, Rui is an experienced CEO and founder of companies in the ICTE sector, as well as in advisory and management roles in local development entities, having served as Executive Board President at INOVA-RIA. Rui is currently developing his PhD research work in the domain of Regional Urban Planning.



Designing and implementing a distance programme for project managers in Ethiopia, Kenya and Uganda

David Smith, Sheila Vaughan, Derek Eldridge & Lujia Feng

Abstract

The article describes an innovative distance learning programme, entitled Transformation in the Workplace, developed at the University of Manchester (UK) in response to an international donor's request to improve project outcomes in its partner agencies in Ethiopia, Kenya, and Uganda. The focus was on improving the skills of personnel working directly with poor communities across a range of project areas in order to provide more effective outcomes, to encourage sustainable processes of improvement through individual and group learning and to positively impact on the planning and implementation capacities of the agencies concerned. It was envisaged that radical changes were needed in the conventional top down styles of project management to encompass an approach driven by self-organized learning and systems thinking, which have influenced the Programme design to create a collaborative learning culture and assessment activities which are entirely based on the actual work responsibilities of the participants. Reference is made to an independent evaluation of the Programme's impact which is extremely positive at community level and in terms of the professional development of participants.

Introduction

The Transformation in the Workplace Programme was developed at the University of Manchester (UK) in response to a request by an international donor, Tearfund, to meet the learning needs of project managers in its partner development agencies situated in Ethiopia, northern Kenya, and northern Uganda. The project managers involved generally had accumulated field experience and had a range of differing responsibilities across varied anti-

poverty projects to improve health, food security, rural incomes, and access to a clean water supply, and were mostly well versed in the needs of poor communities. From the outset it was necessary to mount this programme in-country, not primarily for financial reasons, but from what was envisaged concerning the necessary quality of the learning experience and resultant actions that would build collaboration between the project managers and stakeholders to deliver project goals. It was also anticipated that the learning design would have a positive impact on the capabilities of the partner organizations leading to a transformation in the way they understood community needs, project processes, and the required changes in the supporting organization and management development practices. A key need to be addressed was how to move beyond conventional project management training to invoke a direct link between learning and a systems approach to fully meet community needs. The intention was to bring project performance and community well-being to a much higher threshold of achievement.

The sections that follow cover the design of the Programme, a brief portrayal of its main conceptual credentials, including self-organized learning and systems thinking, its academic structure and an evaluation of impact.

Programme design

As an institute with a long and fairly significant record in mounting practitioner orientated development courses, we were confident that we could meet the sponsor's stated requirements and bring about the change envisaged to significantly improve the effectiveness of the project managers with a course design that would more than

just meet the desired intentions but embed a sustainable self-organizing practice within the communities which significantly enhance their wellbeing.

We were very much aware of the shortfalls that can occur in traditionally organized programmes mounted in a university context, in which ‘experts’ may dominate learning activities through traditional lectures and seminars, however well-intentioned is the stated aim of learner participation. This view was based on the perspective of our own institute’s previous experience with management development programmes and what has been reported widely in the literature (Beer, Finnstrom, & Schrader, 2016, Baldwin, Ford, & Blume, 2017). It seems in seeking learning outcomes the risk of failure mounts when participants are not:

- Selected according to criteria focused enough in terms of project needs, and at worst arrive on a programme as a result of ‘whose turn is it next’.
- Fully engaged from the start in determining and meeting their own specific learning needs.
- Involved in developing clear evaluative criteria for the learning event prior to its commencement and as adapted as learning experience accumulates.
- Required to prepare action plans that transfer their new learning directly to the workplace.

Thus it was very welcome when the Tearfund Project Leader made it clear right from the start of the conversations that the intended Programme was to have a completely new approach which would fully establish a collaborative venture with the client organization and associated in-country partners and on into the communities they serve. In fact the innovative learning model envisaged would not just counterbalance those perennial risks referred to above but would forestall their emergence. Tearfund’s Leader had clearly learnt from his own experience how resources could be wasted as a result of misguided designs and the behaviours of resource persons and participants not fully engaged with the need for generative change in the poor communities they were working with.

What were mapped out in the first stage of discussions were the required structural elements of the proposed programme which would be in-country at a suitable venue in terms of encouraging a learner centred approach. Each tranche of participants would be twenty in number drawn from across the partner organizations but would also include Tearfund personnel from the Addis Adaba Office who would also provide administrative and learning resources support. Given the current qualifications, experience and expectations of the proposed participants, Tearfund had advised that this should be an academically accredited programme at postgraduate level. Given our experience, as referred above, we were somewhat wary of this but were persuaded of the necessity of this given the design and methodologies envisaged which would overcome risks associated with the ‘diploma disease’. The main driving force of the Programme would be its total integration with the on-going work of the project managers gearing their learning to the enhancement of the

wellbeing of communities for which they are responsible. It would adopt an underlying philosophy and innovative methodologies for significantly improving current project management practices but would only succeed through co-operation with and acceptance from all stakeholders. As agreed the Programme would need to be held in-country involving University personnel travelling to Addis Adaba for workshops, development partner consultations, and project site visits, although a longer term prospect was recognized that local academics and practitioners would eventually take over.

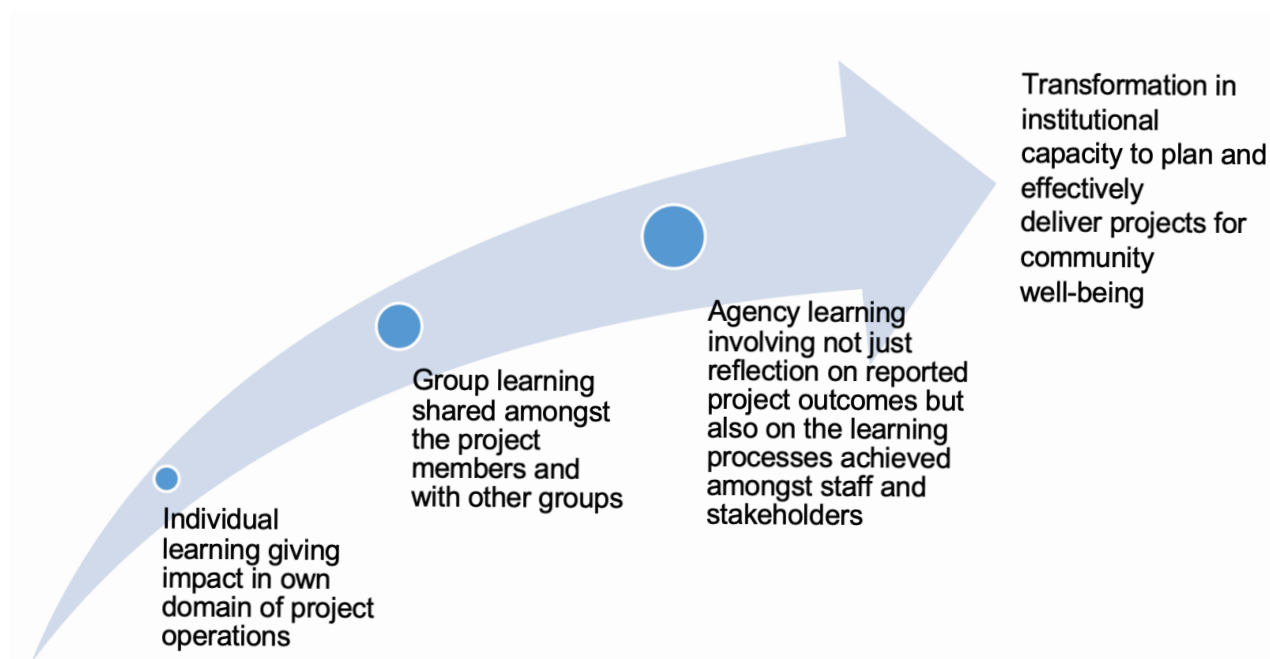
Such an approach would be supporting individuals’ development in respect of gaining knowledge on specific advances in project management techniques but primarily in building learning impact on a systems basis as indicated in Figure 1. Learning resources to achieve these two aspects would rest on shared practitioner knowledge, coach support in workshops, online access to the Manchester University Library and a local learning centre specifically set up for the Programme. Summing up the agreement to proceed, the distinct qualities would:

- Focus directly on the abilities of project staff to invoke a self-owned change process in the communities.
- Build the learning skills of participants with ultimate benefit to group learning on an intra- and inter-project basis.
- Incorporate diagnostic tools to map out responsibility and quality impacts within individual projects and measure outcomes on the initiatives taken.
- Build group and stakeholder momentum for improved project methodologies geared towards an effective impact on community well-being.
- Have as an enduring feature a learning and systems focus directly relevant to building a sustainable institutional capability in the development agencies involved.

It was clear from this remit, that while academic accreditation was stated as a necessity, a conventional postgraduate type programme, however sound its quality, would not meet the requirement, even if packaged in a learner friendly distance format. It had to be something fundamentally different yet still meet the academic structures and methods of the accrediting university. Additionally, given the intended scope of being close to clients’ needs, both in actions and spirit, most learning activity would take place as close as possible to the actual contexts in which the participants are engaged. Academic resources would need to be planned specifically with context in mind, including guided access to key relevant literature, in hard copy and online, and the choice of appropriately qualified practitioners available to work in-country.

In achieving this the Programme required the explicit support not only of each participant’s line manager but also of senior personnel within their respective organization. This is not simply because time must be allowed within the working week to undertake the Programme but because the assignments themselves relate directly to an analysis of and change in the work systems in which participants

Figure 1
An integrated learning system for project outcomes



and other stakeholders are involved, including the preparation of action plans to improve effectiveness. Thus the Programme uniquely offers an organizational focus for improvement as well as development opportunities for the individuals concerned as they focus on their own project domains. The start of the opening workshop was planned to include at least one senior manager from each of the participating development agencies so that the overall agenda for change could be made explicit.

Conceptual framework

As agreed from the beginning, the Programme would not rely on a traditional approach of dominating the learning environment through ‘expertise’ out of the heads of the trainers/consultants. The traditional approach is inappropriate for two reasons:

- It operates from a trainer’s model of ‘best practice’, which usually means ‘western best practice’, which risks minimizing a focus on real stakeholder needs and on the critical situation of local communities;
- It can foster a dependency of participants on those who are presenting knowledge, meaning that any understanding achieved may not yield sustainable learning ‘beyond the classroom’.

As a result, in launching each stage of the programme the primary purpose of building learning leadership is discussed with participants with a view that it should be based on the development of their own learning skills and on their ability to impart this capability to all stakeholders to enhance project capabilities in a mutually sustainable manner.

Additionally, the Programme stresses right from the start that achievement in each participant’s work domain requires an explicit systems focus on the link

between project needs, ownership, delivery, evaluation, and sustainability. For participants, already qualified in project management, this implies sharing and reflecting on their experiences and making explicit the aims of the development project they are currently engaged in and expressing their self-recognized development needs. Such an exposure takes place in a coach led introduction to the required analytical tools to raise data, build conversation, and seek improvements in project work while also focusing on a manager’s learning capability. This process is at the heart of what the Programme leaders believe is a new paradigm for the development of project management skills, which ultimately achieves a shared and relevant learning experience for the project managers themselves, their colleagues, the communities they serve, and the senior managers in their respective development institutions, as implied in Figure 1. This conceptual underpinning is intended to achieve sustainable change impacts in current projects and also set in motion an innovative approach for future development activities. Such a transformation implies a step change in project managers’ perception of community needs, reflective capability on their own skills, and willingness to take up the challenge of self-empowerment in a shared learning environment (Holten & Brenner, 2015). It is explained from the outset that such a move forward is dependent on linking a significant change in individual and group learning capability with a systems approach to project work (Learning as a System, Project as a System, Community as a System).

Self-organized learning

The emphasis on the Programme to achieve a seamless approach to learning and its application on projects means a radical shift from the conventional methodologies

usually presented on project management development programmes. The first main concept for this seamless underpinning of Programme activities is self-organized learning which has increasingly been recognized as a significant factor in achieving change in organizations (Harkema, 2003). Although organizational practice with the methodology is still subject to much development, there is growing evidence that a rapidly changing society requires greater emphasis on learning skills and their application in rising to the challenge of ever-changing information and skill demands in the work environment (Kivunia, 2015). In development activities that are mainly classroom based it may be difficult if not impossible to enact activities that fully stimulate individuals to comprehend how they can expand the skill of learning and directly apply the new capability (Vaughan, 2003). While this Programme is based on a distance learning format with a prescribed set of intentions and purposes and assessment requirements, the application of andragogical principles into the design provides opportunities for the participants to establish their own learning purposes and activities within the overall scope of the project goals required by their employing agencies (Blondy, 2007).

Building self-organized learning into the curriculum is not just to enable project managers to communicate its importance but also for them to support others in developing the capability. The chosen approach for the Programme to link self-organized learning methodologies directly to project practices is based on research undertaken by Laurie Thomas and Sheila Harri-Augstein at the Centre for the Study of Human Learning at Brunel University (Harri-Augstein & Thomas, 1992). The advantages of developing proficient self-organized learners is that they:

- Enter change situations with a clear sense of their own learning purposes and needs.
- Can overcome the limitations of traditionally organized training by recognizing what they want out of such an experience, i.e. use trainers/experts as resources for learning on their own terms.
- Adopt a generative approach to change in which new outcomes and results are emergent.
- Are better equipped to take advantage of spontaneous learning opportunities because they are consciously aware of their learning purposes and their abilities to learn.
- Can magnify these four attributes when placed in a systems approach to change, as referred to in the next section.

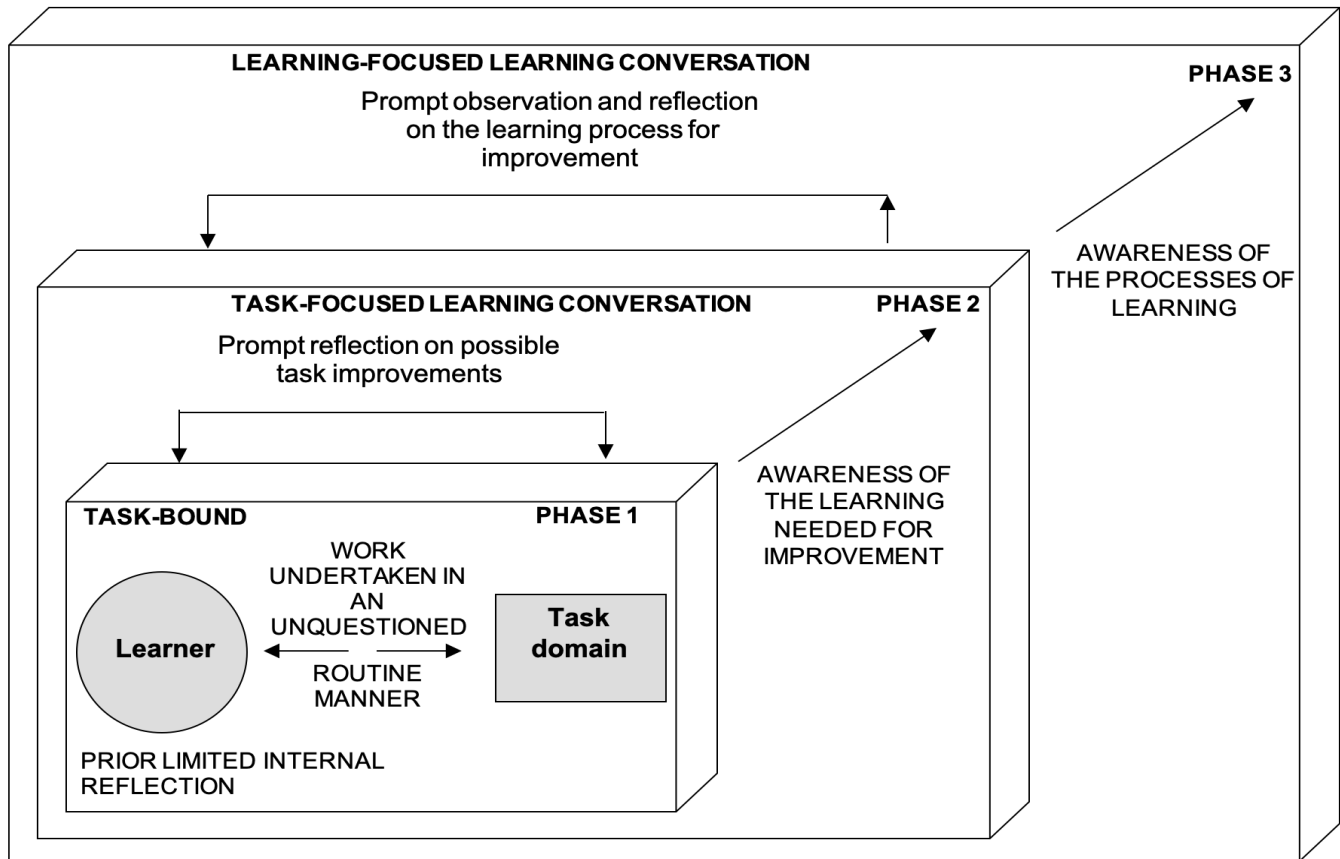
To build a capability in self-organized learning requires the development of terminology to generate internal reflection, to initiate own responsibility for learning skills development and to share with others progress in these respects. The emphasis on the uniqueness of each individual's need and scope for change creates a methodology for skills improvement very different from what might be experienced by a learner in a conventional training programme, often subject to the application of the systematic learning (training) cycle. Harri-Augstein

and Thomas (1992) introduced the three part 'learning conversation' to help learners acquire the perceptiveness and reflective capability to progressively expand the scope and quality of their learning. This involves a process of sustaining a 'conversation with oneself about learning' and then through practice and feedback to discover what works best and under what conditions. This process can initially be prompted by coach support to help an individual reflect upon what happens when they face the need to improve what they currently do in one important area of work responsibilities and is embodied in the first of the 'learning conversations' namely the 'process dialogue' shown in Figure 2. This is concerned with what an individual faces when moving from a routine exercise of tasks in a focused area of work to achieve a higher level of performance and is aimed at raising the individual's awareness of their own learning capabilities in terms of what has to be accomplished. As the basis for Figure 2 Harri-Augstein and Thomas explain how well practised tasks and the skills applied in work often stabilize into robot-like, unconscious routines, which need to be exposed if improvement is to be achieved. In phase 1 individuals tackle a task almost automatically but when prompted can move to phase 2, as they concentrate on doing the task but begin to develop an awareness of their thoughts and feelings about how it can be improved. This enables them to begin to experiment in seeking more effective methods through learning. In phase 3, learners begin to reflect on how they have learnt whilst improving what they do, as well as how they have thought about it. As a consequence, self-organized learners acquire the capacity to conduct two parallel conversations, one that is task-focused (phase 2) and one that is learning-focused (phase 3). In subsequent improvement activities they then build on this experience and gradually learn to describe and challenge the learning process for themselves as they seek to improve it and its outcomes.

Experience suggests that the reflective process necessary to progress through the three phases in Figure 2 is not easy. The learning conversation can be both challenging and emotionally difficult. It can involve the disruption of existing skills and habits, leading to a temporary drop in performance as the acquisition of new skills is focused upon. This is why in the early stages of building a self-organized learning capability the use of a learning coach may be essential, a role usually undertaken in the first Programme workshop by a resource person. Essentially the coach's role is to help learners to observe themselves at work, and to internalize the conversation and to learn how to sustain it by themselves (Harri-Augstein and Thomas, 1992). The learning coach gradually passes control over in the learning conversation to the learner, introducing the other two dialogues of the 'learning conversation' when required:

- The support dialogue deals with the emotional context to explore and to overcome constraints in the development of learning capability that participants may encounter.
- The referent dialogue assist in the definition of the

Figure 2
Building a self-organized learning capability



Source: adapted from Harri-Augstein and Thomas (1992).

referents or criteria against which participants can begin to assess their competence as learners.

Participant feedback from the initial stages of the Programme indicated a clear progression through coach guidance and practice in delineating these types of dialogue and in establishing an inner learning capability. Mutual support was also achieved through ongoing learning conversations between colleagues contributing to a shared learning culture for improving project capabilities. Thus in later stages of the Programme they could support each other as learning skill coaches in place of the resource persons.

Systems thinking

As stressed, the importance in the Programme is for participants to grasp the significance of self-organized learning in their working lives, not purely from a self-interested perspective, but for improving project and development agency performance. Research evidence suggests that the application of enhanced learning abilities becomes significantly more powerful when placed in a systems approach to change (Serman, 2001; Chroner & Bucklund, 2015). Thus on the Programme, the application of a systems approach is a fundamental ingredient in making project processes effective and in maximizing the impact on communities' well-being, with considerable influence on this approach being derived from several

key researchers (Rihani, 2002; Ackoff, Magidson & Addison, 2006; Wahl, 2016). The design of the academic assessments consistently incorporates systems thinking as a key component that participants should initially appreciate and then over the duration of the Programme adopt as naturally essential to decision making and subsequent actions.

An explicit focus on systems as a backbone to project management also integrates decision making at all levels, a process which goes well beyond just establishing individual job accountabilities and activating reporting structures. This systems view implies that the measurement of performance at a project wide level becomes increasingly important for managers to undertake (Ross, 1999; Deming, 2018). Additionally, systems thinking creates conversation amongst managers and stakeholders to stimulate joint understanding and ownership, allowing the shared learning process to invite changes when and where these might be advisable. This approach also links significantly with the work of Deming who perceived an organization as having activities and jobs linked together in a total process (Brown, 2019; Tribus, undated), in which intention leads to outcome through the input of stakeholders and employees who progress a core work process divided into stages, as illustrated in a systemic manner in Figure 3. This view contrasts sharply with how many project organizations have traditionally conceived their decision

procedures, as experienced by some of the Programme participants. The traditional approach is associated with an over emphasis on hierarchic control to achieve planned results and recipient impacts. The danger of this approach is that it can invoke linear thinking with an undue reliance on formal reporting procedures, ignoring the systemic nature of work which encompasses necessary and complex interactions taking place across a project. A systems view gives the opportunity to channel energies into activating and sustaining informal feedback mechanisms between project personnel and stakeholders that enable the total system to adjust to meet recipient needs more effectively. As can be seen from Figure 3 the systems approach as applied to projects provides data feedback to stimulate thinking on how the responsible development agencies can comprehend their own institutional reform needs.

Based on the views of Deming, the approach for project management, as illustrated in Figure 3, implies

that at every stage of the work process from the individual level right through to the organizational, people need to see themselves as both customers and suppliers in a chain of actions that have constant feedback for learning and improvement. Instilling quality in performance thus builds from supplier/client learning conversations on project design through to implementation and evaluation. At every stage work is completed, data and input resources change state and then become output for the person(s) at that point in the process. Output from there then becomes input in the next stage where its state is changed again as it is converted into new output and so on until the final product or service reaches the ultimate client. At every stage of every process, there is a person, team, department, or organization that is responsible for converting inputs into outputs on a supplier/client basis, with final outcomes being researched to generate feedback data in the system. Drawing on the ideas of Deming, the implication is that

Figure 3

A systems construct for project processes to improve community outcomes and institutional capability

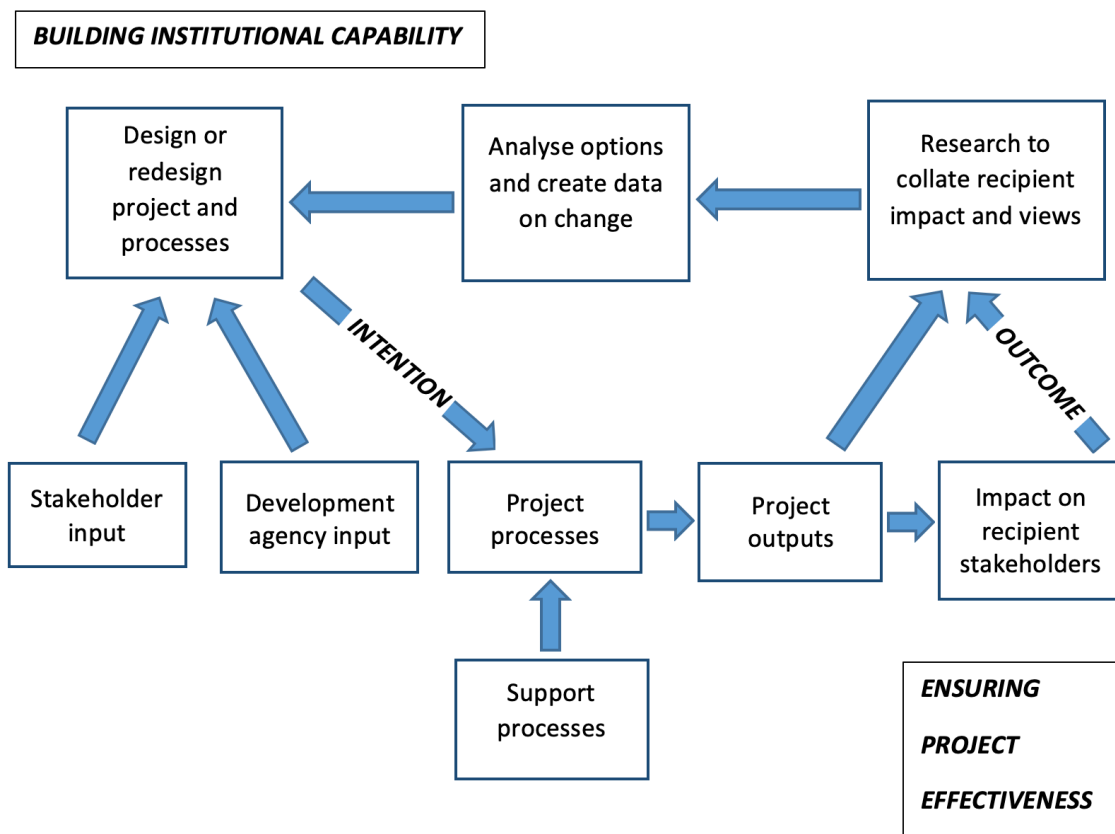
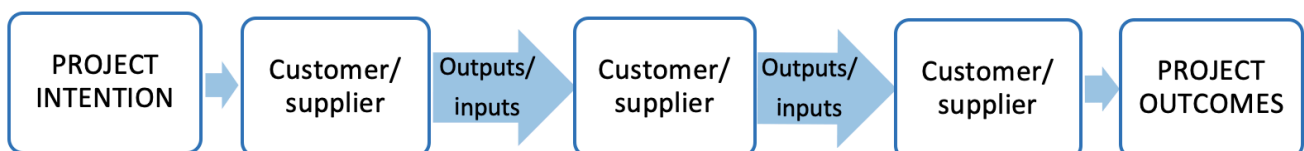


Figure 4

Maximizing community impact through conversation and learning on a customer/supplier basis in the whole project process



the supplier/client relationship work configuration, as portrayed in Figure 4, is fundamental to the processes of Figure 3, as supplier/client relationships which generate data exchange, learning, and shared understanding as the project management process proceeds, not just for improvements necessary at a particular stage but for the whole system as well.

The key concepts embodied in Figures 3 and 4 influence the design of assignments on the Programme. For instance, a typical assignment during the first module is to invite participants to construct a process map of their project area, actually doing that at work, to identify their main 'customers and suppliers' (internal and external) and to assess in their own words how satisfactory the system is at the current time. Another key assignment is reporting on the development and implementation of an action plan which focuses on a different 'subject area' in the case of each participant, e.g. improving project reporting skills, designing monitoring and evaluation activities or creating a more enabling culture in the workplace for project design and delivery. All these activities could be 'topics' to be studied in a traditional project management course but in helping participants to acquire learning leadership capability, through the development of self-organized learning and the adoption of a systems approach, leads to direct application of newly acquired skills to their actual workplaces. When they try them out in assignments and dissertations directly linked to their project work, the methodology of the Programme promotes learning and feedback for improvement in a flexible manner in real time and not just as part of a formal review process. Thus the chances are high that learning and feedback on implementation are real, relevant, and developmental.

Academic structure

The Programme leads towards a master's degree and is designed over three distinct periods of study. Each level offers a mix of full and part time participation with some in-country workshops and it is the study within and about the participant's own working environment which forms the basis for the application of the learning taking place. The tutor led activity at each level (Certificate, Diploma, and MSc.) takes place at intervals over thirty six weeks in one year with in-country workshops synchronous to some extent to involve all three levels of the Programme to contribute to the upward learning impact for building institutional capability envisaged in Figure 1. The outline academic structure is shown in Table 1. Each level is nine months part time with a participant being able to proceed to the next level on the achievement of 60 credits.

At Certificate level the intention is to help people to become skilled Learners while the Diploma level offers the opportunity for skilled Learners to become Learning Practitioners, to enable others in the system to become better learners and gain an awareness of systems thinking. Finally, at MSc level, participants are given the opportunity to develop into Learning Managers with full proficiency to help fulfil the systems approach to project

management shown in Figure 3 to effect significant change at the agency level not only in the way projects are planned and implemented but progressing beyond and merging into the organization as an operating system. Thus all functions of the organization become integrated and behave as 'Customers/Suppliers' establishing 'Feedback for Learning' as an alternative to traditional performance assessment.

At all three levels in the Programme participants are encouraged to make their project work explicit through process mapping as a prelude to the measurement of performance, including a study of its variation, with the aim of improving the quality of control of the system. In parallel, the building of an individual's perception of organizational decision making and what constitutes effective performance is stimulated through the use of analytical tools and the resultant discussion. Raising data in this manner enables participants not only to further performance in their own work domains but to respond effectively to challenges posed by more traditionally inclined managers in their respective agencies.

The topics chosen for the assignments are rooted firmly in the real workplaces of the participants. Not only are assignment approaches developed in the face to face programme workshops, they are applied and tested by a participant directly in a project, so there are 'Before, During, and After' perspectives which give rise to valuable exchange amongst participants on the design and implementation issues. Review of progress by each participant is integral to the approach at all stages of the Programme and not just at the end. At the MSc. Level the focus is at the level of agency performance as a culmination of the learning and project systems approaches experienced at the Certificate and Diploma levels. Reflection on and write-up of the design, implementation and impact of the wider systems improvements that are possible forms the body of the dissertation. In assignments at all three levels learning becomes both real and relevant with no element of the hypothetical approach often found in traditional academic management programmes. The strategies used for participants to progress their study skills and assignment writing are varied and include books, articles, and reports made available as hard copies and online from the University Library and external learning resources such as documentation produced by NGOs or partners, conversations with domain experts, colleagues, and fellow participants', with regular support and guidance by tutors, both online and in workshops.

Evaluation of impact

Tearfund UK as the main donor has a keen interest in evaluating the impact of the projects included in the Programme which are the responsibility of its partner agencies in Ethiopia, Kenya, and Uganda. To this end it commissioned an evaluation study in 2007 led by an independent consultant aimed at assessing the outcomes achieved by the 2004 participants (Massink, 2007). An extract from the executive summary of the evaluation is

produced below:

The findings strongly show that judging by the actual impacts in communities and in their organizations, most participants were enabled by the learning programme to bring lasting, and in some cases deep, impacts that have and are affecting the lives of poor people through changed working practices. The impacts offer convincing evidence, with little exception, that the programme has achieved transformation in the work place through participants applying a systemically informed, feedback-rich, participatory assessment, planning, implementation, monitoring, and evaluation approach to projects of which they are a part (4.1.1).

The capacity of participants to design and implement changes to working practice was for the majority of participants perceived as having significantly improved. Indeed, in a few cases the programme was said to have been positively life-changing in terms of both personal and professional effectiveness to assess, plan, and bring about change. Most managers spoke very positively about the increased capacity in their staff which, with a wide range of other evidence sources, gives great credence to the effectiveness of the programme (4.1.2).

The learning programme placed huge value on the ability of people to perform as self-organized learners. While this assessment repeatedly identified some feedback that saw little value in having participated, there was a clear consistency in participants about having become much more empowered, confident, reflective, consciously aware, and active learners. The programme, for the most part, was a very illuminating and releasing experience which is having practical benefits (4.1.3).

Further evaluation of later phases of the programme is anticipated.

Table 1

The accreditation structure for the Transformation in the Workplace Programme, University of Manchester, UK

Certificate programme	Credits
OA7000 Learning to change the workplace and one's own role in it	15
OA7010 Transforming the workplace: the design of a change initiative that increases organizational efficiency and effectiveness	15
OA7020 The process of transformation in the workplace	15
OA7030 Evaluating and sustaining transformation	15

Diploma Programme	
OA7040 The learning process and transformation	15
OA7050 Systems thinking and transformation	15
OA7060 The constructs and context of transformation	15
OA7070 Measurement and evaluation of transformation	15
MSc Programme	
OA7080 Research skills	15
OA7090 Dissertation	45

The certificate programme aims to:	
01	Assist individuals to improve their learning skills to become better learners at an individual level.
02	Assist individuals to understand the basic concepts of systems thinking.
03	Apply systems thinking and learning skills to an identified problem within their workplace to bring about transformation at an individual level (with line management agreement).
The diploma programme aims to:	
01	Assist individuals to become "learning practitioners" supporting learning within their immediate work group.
02	Assist individuals to understand deeper concepts of systems thinking and complexity theory.
03	Apply systems thinking and the new learning skills to an identified problem to bring about Transformation within their workplace by engaging collaboratively with work colleagues (in agreement with appropriate levels of management).
The MSc programme aims to:	
01	Provide opportunity for thorough research and investigation into key thinking around the learning process and the organization as a system of learning.
02	Provide opportunity for thorough research and investigation into key thinking around organizational change and complexity.
03	Support the application of a proposed action plan for transformation at agency level with the involvement of senior level managers and policy managers.

Conclusion

Overall, the Programme is not just to help project managers to learn specific skills but to build their capability as effective learners – to develop skills of learning itself as the basis for transformation in the quality and impact of their project work. This is based on the philosophy that learning is a discipline in its own right and that people can be professionally orientated in the pursuit of their own ‘learning excellence’. The culmination of the learning achieved on the Programme comes with the completion of a dissertation based on a choice of each participant’s work priorities but directed at having outcomes relevant to their own employing development agency. The participant first identifies the needed change, then formulating a higher level intention; developing do-able purposes from that; creating the strategies which will lead to implementation, and finally formulating the anticipated (and measurable) outcomes as a prelude to action. Sometimes participants may decide to concentrate on a topic for their action plan which turns out not to be a priority after discussion with stakeholders, setting in motion discussion and agreement on what should be done. What they learn in this whole approach of placing Programme learning directly in their workplaces, however, is an invaluable and transferable methodology for applying to any new learning need. Further, the synergistic emphasis on self-organized learning linked to systems thinking will serve them well on any organizational/community development/management issue which will emerge in the future. The focus is on the future – the importance of ‘vision’ underpinned by the thinking that ‘if we can’t see the future the future is now’ and that ‘development is not a ‘production’ issue rather it is an issue of learning’.

Further, an innovative feature of the Programme is that it encourages the development of intrinsic support networks so that each of the three levels are interlocked in presence and experience exchange, with for instance the Diploma workshops in-country overlapping to a degree and providing support to the Certificate level activities. Assignments and workshops exploit any opportunity to encourage this but also there is an expectation that this will begin to happen outside of the times when assignments and workshops are underway, particularly when participants are employed by the same development agency. The overall intention is for transformation to be owned by the organizations and the communities themselves and any reliance on University support should begin to lessen quite noticeably by the time many MSc. participants have completed their studies.

Finally, it should be noted that while an academic structure has been wrapped around the fundamental process of linking learning with systems thinking for effective project outcomes, the conceptual model is also valid for use in activities not destined for accreditation. The reason in this case for the academic stamp of approval has been the necessity to meet the career aspirations of potential candidates already well qualified from conventional project training. In fact, the model itself is

based on self-organized learning and a methodology that embraces organization activities as being open to systemic analysis has the potential for wider application in change management and personnel development at all levels.

Acknowledgements

With gratitude to Tearfund (UK) for inviting us to participate in this unique and developmental project, and to the University of Manchester (UK) for enabling a radical approach to distance learning accreditation and for the reproduction of Table 1.

References

- Ackoff, R. L., Magidson, J., & Addison, H. J. (2006). *Idealised Design: Creating an Organisation's Future*. Pearson, Wharton.
- Baldwin, T., Ford, J., & Blume, B. (2017). The State of Transfer of Training Research: Moving Toward More Consumer-Centric Inquiry. *Human Resource Development Quarterly*, 28(1), 17-28.
- Beer, M., Finnstrom, M., & Schrader, D. (2016). Why leadership training fails and What to Do About It. *Harvard Business Review*, Oct.
- Blondy, L. C. (2007). Evaluation and Application of Andragogical Assumptions to the Adult Learning Environment. *Journal of Interactive Online Learning*, 6(2), 116-130.
- Brown, C. (2019). Why and how to employ The SIPOC model. *Journal of Business Continuity and Emergency Planning*, 12(3), 198-210.
- Chroner, D., & Bucklund, F. (2015). A Holistic View on Learning in Project-Based Organisations. *Project Management Journal*, 46(3), 61-74.
- Deming, W. E. (2018). *The New Economics for Industry, Government, Education* (Third Edition), MIT, Cambridge Mass.
- Harkema, S. (2003). A complex adaptive perspective on learning within innovation projects. *The Learning Organization*, 10(6), 340-346. Retrieved from <https://doi.org/10.1108/09696470310497177>
- Harri-Augstein, S., & Thomas, L. (1992). *Learning conversations: the self-organised learning way to personal and organisational growth*. Routledge, New York.
- Holten, A. & Brenner, S. (2015). Leadership style and the process of organizational change. *Leadership & Organization Development Journal*, 36(1), 2-16. Retrieved from <https://doi.org/10.1108/LODJ-11-2012-0155>
- Kivunia, C. (2015). Teaching Students to Learn and to Work Well with 21st Century Skills: Unpacking the Career and Life Skills Domain of the New Learning Paradigm. *International Journal of Higher Education*, 4(1), 1-11.
- Massink, J. (2007). Evaluation of Transformation in the Workplace: a Postgraduate Programme to Improve the Effectiveness of Project Cycle Management. Tearfund, London (unpublished).
- Rihani, S. (2002). *Complex Systems Theory and Development Practice: Understanding non-linear realities*. Zed books, London.
- Ross, J. E. (1999). *Total Quality Management: Text, Cases, and Readings*, Third Edition. Routledge, New York.
- Sterman, J. D. (2001). System Dynamics Modeling: Tools for Learning in a Complex World. *California Management Review*, 43(4), 8-25.
- Tribus, M. (undated). *Quality in Education According to the Teachings of Deming and Feuerstein*. Myron Tribus, CA.
- Vaughan, S. (2003). Performance: Self as the principal evaluator. *Human resource Development International*, 6(3), 371-385.
- Wahl, D. C. (2016). *Designing Regenerative Cultures*. Triarchy Press, Axminster.

About the authors



David Smith

David Smith is a Visiting Lecturer at the University of Manchester, formerly a Senior Operations Manager and then a Senior Human Resource Manager in a large public corporation, in which led a national project to ‘improve the effectiveness of front- line managers’, based on self-organized learning and systems thinking. As a learning practitioner he has participated in accredited and management development programmes in the Global Development Institute, University of Manchester and as an independent educator has contributed to transformative change in organizations in the UK and in developing countries.

Sheila Vaughan

Sheila Vaughan was a Lecturer at the University of Manchester focusing on information systems, learning and ‘Self as the Principal Evaluator’ across a range of postgraduate and post experience programmes. She acted as lead consultant on projects for the World Bank, Commonwealth Agricultural Bureau, Save the Children and Tearfund.



Derek Eldridge

Derek Eldridge is a former Senior Teaching Fellow in the Global Development Institute, University of Manchester, UK, where he is now as an associate involved in postgraduate teaching in human resource development, learning systems enhancement and organizational change. He has extensive experience in capacity building projects for overseas governments and international donors In Africa and Asia particularly in the development of managers’ capabilities, HR strategies and the evaluation of project outcomes.

Lujia Feng

Lujia Feng is a Lecturer in the University of Manchester’s Global Development Institute, a multidisciplinary research and teaching community, and provides academic leadership in teaching and research, including distance learning curriculum development. Her main teaching responsibilities involve human resource practice, managing quality in development and research methods.



EDITORIAL ADVISORY BOARD



Ramli Atan
Learning Specialist, PETRONAS
Leadership Centre
Master's in
Curriculum & Instruction



Ajantha Dhamasari
Director & Chairman of the
Postgraduate Institute of
Management,
University of Sri Jayewardenepura
PhD & MBA



Geoffrey Elliot
Professor of Post-Compulsory
Education, University of Worcester



Ruksana Osman
Professor of Education, University of
the Witwatersrand



Berna Ostinaz
Chairman of the board, Peryön
MBA



Chantelle Brandt
Senior Business Leader and Board
Member, DBA



Hilary Claire-Fraser

International Organisation Director
Master's in Audit Management and
Consultancy



Jorge Jauregui

Corp. Director HR, Americas Mining
Corporation
Master's in Organisational
Development



Marguerite Eid

Notre Dame University, Lebanon
MBA



Allyson MacVean

Professor of Policing and
Criminology, Bath Spa University



Marita Salo

Executive Director, HENRY



Muhammad Shujahati

PhD candidate, Knowledge
Management & E-Learning Lab,
Faculty of Education of Education,
University of Hong Kong



Alexey Verbetsky

Deputy Director, School of Public
Policy and Management, RANEPa



Rob Poell

Professor of Human Resource
Development, Tilburg University, PhD



Eduardo Tomé

Universidade Europeia, Lisbon
PhD

EDITORIAL TEAM AND BOARD OF DIRECTORS



Mark Loon
Co-Editor in Chief
Editorial Team & Board of
Directors
Bath Spa University



Maria José Sousa
Co-Editor in Chief
Editorial Team & Board of
Directors
ISCTE/IUL



Rick Holden
Emeritus Editor
Editorial Team & Board of
Directors



Gillian Lonergan
Production Editor
Editorial Team



Kirsty Folan
Editorial Assistant
Editorial Team



Bob Morton
World Federation of People
Management Associations
Board of Directors



Wilson Wong
European Association
for People Management,
Chartered Institute of
Personnel & Development
Board of Directors



Sarah Fidment
University Forum for HR
Development
Board of Directors



Trent Burner
World Federation of People
Management Associations,
Society for HR Management
Board of Directors



Fiona Robson
Chartered Institute
of Personnel and
Development
Board of Directors



Mission Correctional
Institution
Estimates

OFCC
Office of Federal Contract
Compliance Programs

Brewer-Garrett.com phone: (440) 243-3535 fax: (440) 243-3536

100
100

100
100



The journal is sponsored by a partnership between the World Federation of People Management Association (WFPMA), the University Forum for Human Resource Development (UFHRD) and the European Association of People Management (EAPM).