

# Preparing project managers for the human aspects of project work: fostering sensemaking abilities

## Abstract (\* mandatory field)

### **\*Purpose**

To prepare project managers for the human aspects of project work using a new classroom-based approach to foster collective sensemaking abilities.

### **\*Design/methodology/approach**

We developed an approach for fostering collective sensemaking abilities through three class sessions inspired by Merrill's First Principles of Instruction. We implemented the sessions in two cohorts of students, with a total of 57 participants, and evaluated its impact through a series of surveys.

### **\*Findings**

Findings demonstrated how each component of the educational approach contributed to an increase in students' sensemaking understanding and ability. Through explanation, demonstration, and application components, students reported increasing levels of confidence in their ability to facilitate collective sensemaking in practice.

### **Research limitations/implications**

Our findings are based on a sample of 57 students in one university setting. Further studies are required to evaluate the educational approach; such studies could use larger numbers of students or other education settings. Triangulating students' reported understanding and abilities would increase confidence in the effectiveness of this approach.

### **Practical implications**

By explaining our approach to sensemaking education and providing initial evidence of its success, we provide educators with an example of how to foster collective sensemaking through classroom-based project management education. The approach has potential for teaching other interpersonal skills.

### **\*Originality/value**

This research provides a novel classroom-based approach to fostering sensemaking awareness and skills, and for dispersing contemporary project management thinking and tools to practitioners.

## Keywords

Sensemaking; Project management education; Project-space model

## Introduction

The need to prepare project managers for the human aspects of project work is well established. Our research addresses this need through an educational approach that is shown to foster sensemaking awareness and ability. The criticality of project managers' soft or interpersonal skills has been proposed by many scholars (see, for example, Syed et al. (2010); van der Hoorn (2018); Walker and Lloyd-Walker (2018)), with the prevalence of collective sensemaking in project work receiving particular attention (Hoezen et al. 2013; Jerbrant & Karrbom Gustavsson 2013; Walker et al. 2014). Fifty-seven students participated in our evaluation of an educational approach designed to foster collective sensemaking abilities by developing students' knowledge and experience over three classroom-based sessions. We incorporated a contemporary project management tool, the project-space model, as a vehicle for students to experience collective sensemaking. Our results indicate that sensemaking can be developed in a classroom setting, and we contribute to educational theory by demonstrating how the purposefully designed sessions supported student learning. In addition, we contribute to practice by providing educators with an example of an approach for effectively teaching collective sensemaking.

Project management know-how extends beyond the positivist epistemology of the project management bodies of knowledge (Berggren & Söderlund 2008; Thomas & Mengel 2008; Whitty 2011). Project work is complex, and project managers need the ability to manage this complexity (Crawford et al. 2006). Indeed, a large portion of project managing is about managing people and applying so-called soft skills (Stevenson & Starkweather 2010; Syed et al. 2010; Keil et al. 2013; see, for example, Brière et al. 2015; van der Hoorn & Whitty 2016b, 2017a; Caniëls et al. 2019). Walker and Lloyd-Walker (2016, p. 731) find that contemporary thinking, such as the Rethinking agenda, Scandinavian School of Project

Management, and Making Projects Critical stream of research, have “exerted significant influence” in publications within the International Journal of Managing Projects in Business. This newer project management thinking emphasizes collective sensemaking as a process that project managers need to appreciate and facilitate (Thiry 2001; Atkinson et al. 2006; Martinsuo & Killen 2014).

The growing appreciation of the human aspects of project managing has triggered discourse on the need for education that prepares project managers for realities of project work. Walker and Lloyd-Walker (2016) prompt us to consider whether those engaged in project work are benefitting from the new thinking about project work. The criticality of education in the human aspects of project work is repeatedly emphasized (see, for example, Alam et al. (2010); Syed et al. (2010); Turner (2016)), with the literature highlighting the need for project managers to understand and embrace complexity (see, for example, Crawford et al. (2006); Thomas and Mengel (2008); Ramazani and Jergeas (2015)). However, although the literature discusses educational programs and courses that encourage reflective practice (see, for example, Winter et al. (2006); Sewchurran and Barron (2008); Thomas and Mengel (2008)), there is very little guidance on how to teach interpersonal skills, especially sensemaking.

To advance the discussion, we designed an educational approach for the development of sensemaking abilities. We implemented the approach in a classroom-based post-graduate project management course at an Australian university. The approach was developed in accordance with Merrill’s (2002) First Principles of Instruction, and incorporated three components – explanation, demonstration, and application. We drew on a project managing tool, the project-space model, to ground the educational approach. This visual tool offers an

alternative perspective on project work and has been shown to contribute to sensemaking discussions on project status (van der Hoorn & Whitty 2017b). We measured the impact of the educational approach through three surveys, two taken during the class and one six weeks afterwards. The survey items and open-ended questions elicited the students' perceptions of the educational approach and their understanding and thinking about sensemaking. Our results reveal how the educational approach successfully engaged and challenged the thinking of most of the students, with each component of the approach providing new learning and further developing their confidence in managing sensemaking in project environments.

This paper makes a practical contribution to project management education by describing an impactful educational approach that explores collective sensemaking in project work. It demonstrates how educators can incorporate new project management tools into classroom activities. Our study also points towards the usefulness of Merrill's First Principles for fostering student's ability to deal with the human aspects of project work.

This article commences by summarizing the current discussion relating to the skills required to manage project work, drawing particular attention to collective sensemaking. The next section reviews the key trends in project management education and introduces the objective and questions used to guide our study. We then describe the research methodology and present the results. Our discussion examines the implications of the findings, and outlines limitations and future research opportunities. The final section contains our concluding remarks.

## Literature review

### *Interpersonal skills in project management*

Much contemporary project management research brings into focus the need to shift from a technical and rational view of project work to a perspective that recognizes context, socio-political influences, and the criticality of praxis (Cicmil et al. 2006; Lindgren & Packendorff 2006). So-called soft (interpersonal) skills are synonymous with the human aspects of project work and are commonly associated with activities such as leadership, problem solving, and establishing trust; these skills are often positioned as contrasting to technical or ‘hard skills’ (Pant & Baroudi 2008). While this dichotomy is debated (Karrbom Gustavsson & Hallin 2014), it is widely agreed that interpersonal skills are central to managing project work (van der Hoorn & Whitty 2016b; Caniëls et al. 2019). Tacit skills, with their common characterization of being intuitive and context dependent, are critical to project success and are associated with interpersonal skills (Alderman & Ivory 2011; Sunindijo 2015; Zuo et al. 2018). Many studies find that interpersonal skills are a key project managing competency (Stevenson & Starkweather 2010; Syed et al. 2010; Keil et al. 2013; Brière et al. 2015; van der Hoorn & Whitty 2017a). Indeed, Walker and Lloyd-Walker (2018) forecast that interpersonal skills, such as collaboration, will only increase in importance in future project work.

### *Sensemaking in project management*

Within the discourse on the importance of interpersonal skills is a growing discussion on the prevalence of sensemaking in project work. Weick et al. (2005) conceptualize sensemaking as the process by which we determine “what’s the story?” from our unfolding experience. It is the process by which “meanings materialise” (Weick et al. 2005, pp. 409, 410). Weick (2001) explains the concept of sensemaking as a metaphoric ‘mapping’ of a situation which can be the basis of a common understanding of what is occurring and what may need to

occur. In relation to sensemaking in projects, “[s]ensemaking can be seen as a system of interactions between different actors who are collectively using the intervention to individually make sense of a situation. They are, ideally, building a collective understanding of a situation” (Thiry 2001, p. 72).

Project environments are complex and are prone to competing political and social views (Cicmil et al. 2006; Söderlund & Müller 2014). Such project environments have been characterized as “swampy lowlands” ill-suited to technically focused management (Winter et al. 2006, Sec. 4.3). Sensemaking influences many aspects of project work such as scope management (Atkinson et al. 2006), value management (Thiry 2001, 2002), procurement (Hoezen et al. 2013), and portfolio management (Jerbrant & Karrbom Gustavsson 2013; Martinsuo & Killen 2014; Clegg et al. 2018). The language used by project and program managers influences how problems are framed and can impact how an issue is made “sense” of and then resolved (Havermans et al. 2015). The ability to discern the relevant cues in the broader environment is essential in disaster response projects (Gacasan & Wiggins 2017). In complex technology projects the diverse interests of multiple stakeholders necessitates competencies in both formal and informal sensemaking devices (Live Vaagaasar 2011), and a link between convergent collective sensemaking on project success has recently been identified (Brunet & Forgues 2019).

Tools for sensemaking are of growing interest to scholars. Papadimitriou and Pellegrin (2007) discuss how intermediary objects of design support sensemaking. Andersen (2010) proposes an input-process-output perspective, in the form of the X-model, is useful for building an understanding of a project situation. Walker et al. (2014) find that rich pictures are a valuable sensemaking tool in disaster recovery projects, and van der Hoorn and Whitty

(2017b) note that the project-space model supports a collective sensemaking process in project work. In summary, sensemaking is an essential process in project work, with emphasis on the importance of awareness of this process and the tools to support it.

### *Educating project managers*

#### *A call for new educational approaches*

Studies reveal that the human aspects of project work are critical, they also recognize that the technical and rational aspects of the bodies of knowledge are an insufficient basis for educating project managers (Cicmil et al. 2006; Crawford et al. 2006; Berggren & Söderlund 2008; Thomas & Mengel 2008; Louw & Rwelamila 2012; van der Hoorn & Whitty 2016b; Cicmil & Gaggiotti 2018). Bredillet (2010) echoes this sentiment, highlighting the need for education that breaks free from the dominant positivist ontology that has traditionally underpinned the discipline (see Whitty (2011)). However, the discourse on project management education can be further expanded (Svejvig & Andersen 2015). Leimbach and Goodall (2017, p. 68) see the main challenge as teaching “the actual practice of managing projects”, since the contemporary discourse is not sufficiently reflected in education and training for project managers, and most studies fail to “tie the development of softer skillsets to reflections on project complexities and inadequacies of standardized models as explored in newer PM streams” (Leimbach & Goodall 2017, p. 70).

### *New topics for inclusion in project management education*

The project management education literature contains two main streams: *what* to teach and *how* to teach it. To prepare project managers for the complex nature of project work, researchers advocate including a range of new topics in project management education, beyond the areas covered by the dominant bodies of knowledge. For example, research suggests including topics for interpersonal skill development (Sewchurran 2008; Stevenson

& Starkweather 2010; Louw & Rwelamila 2012; Ramazani & Jergeas 2015), understanding the role of aesthetics in project environments (van der Hoorn & Whitty 2016b), and developing the ability to deal with the emotions inherent in the political and social project environment (Thomas & Mengel 2008). Project management education can be improved by raising awareness of the complex nature of project environments (Crawford et al. 2006; Thomas & Mengel 2008; Ramazani & Jergeas 2015) and by addressing the importance of social responsibility and sustainability (Cicmil & Gaggiotti 2018).

Discussions in the literature also encompass the criticality of reflecting on practice, acquiring practical wisdom and understanding a variety of perspectives relating to project management. Reflective practice is associated with practitioners developing the capability to discern the most appropriate tools/processes to use in a specific situation (Winter et al. 2006; Sewchurran & Barron 2008; Thomas & Mengel 2008). Tightly linked with reflective practice is the concept of practical wisdom advocated by Cicmil and Gaggiotti (2018), who argue that practitioners need the ability to combine traditional instrumental views of project work with more contemporary perspectives. Paton et al. (2013) concur, noting that introducing students to diverse perspectives assists in bridging the theory-practice divide, enabling students to see situations in new ways and potentially identify limitations in their existing thinking.

#### *New ways of educating project managers*

The literature on *how* best to educate project managers is more limited than the literature on *what* to teach, and focuses primarily on developing reflective practice as a skill and promoting teaching approaches that encourage reflection on practice. Techniques proposed to encourage students to reflect on their practice include group presentations that require integrating theory with practical experience (Sewchurran 2008) and essays and reports that reflect on their own experience and associated meaning-making process (Berggren &

Söderlund 2008; Cicmil & Gaggiotti 2018). The importance of context and applied learning is also evident in the arguments for closely engaging with industry (Crawford 2006; Berggren & Söderlund 2008; Cicmil & Gaggiotti 2018), and effective strategies are coaching (Crawford et al. 2006) and consulting engagements in the form of thesis work (Berggren & Söderlund 2008). Courses that also take students' cultural factors into consideration (Ojiako et al. (2015)) and incorporate games-based learning will provide project management education that is rigorous and relevant (Hussein (2015)).

### *Sensemaking education*

Although sensemaking education is not reported with respect to project management, some studies in the management discipline propose educational strategies to increase awareness of, and capability related to, collective sensemaking. Case studies in management education illustrate the development of mental models required for management decision making (Liang & Wang 2004). Grounded in the concept of mindful organizing, Gebauer (2012) explains a workplace-based experiential educational approach with a strong focus on collective sensemaking using the concept of "staff rides". Staff rides are a reconstruction of an incident, such as an accident or near miss, with the aim of building a collective understanding of the organizational condition that led to the incident.

Of most relevance to this study is Ancona's (2012) description of how sensemaking is taught at the Massachusetts Institute of Technology as part of leadership training. The approach includes a brief introduction to the concept of sensemaking (an explanation of sensemaking), asking students to reflect on their own experiences with sensemaking, learning about sensemaking through listening to the experiences of other leaders (a demonstration of sensemaking) and then applying sensemaking in a role-play situation (application of

sensemaking). These three components (explanation, demonstration, and application) broadly reflects Merrill's (2002) First Principles of Instruction.

### *Merrill's First Principles of Instruction*

Merrill's (2002) Principles propose four distinct phases centring on a real-world problem: activation of prior experience, demonstration of skills, application of skills, and integration of skills into real-world activities (Merrill 2009). Activation of prior experience can be achieved through providing students with a relevant experience so they can ground their exploration of the topic. The demonstration phase includes both informational and portrayal elements. The informational component consists of general instruction, and portrayal refers to exploring specific cases with the guidance of the instructor. The application phase requires learners to use their new knowledge, and is a way of practising what was been demonstrated, often with peers (Merrill 2012).

Merrill's Principles are derived from educational design theories and have broad influence on educational practice. For example, the Principles have been used as a framework for guiding the development of educational experiences and courses (Collis & Margaryan 2005; Lo et al. 2018), and several authorities argue that educational designs or classes which align with the Principles result in enhanced learning outcomes (for example: Frick et al. (2009); Lee and Koszalka (2016); Tu and Snyder (2017)).

Merrill (2012) posits that the application of new knowledge in a problem-based context is highly motivational, which also contributes to learning outcomes. Educational experiences that encourage participation and active application of skills to real-world scenarios have also been portrayed as enjoyable, engaging, and motivational. For example, Finch et al. (2015) argue that learners with positive emotions about an educational experience will have an

increased interest in developing their professional competence. They also demonstrate that enjoyment and engagement are positively related. Other scholars also support this positive correlation between problem-based and experiential education and engagement, motivation, and enjoyment (for example Dalrymple et al. (2011); Killen (2015)).

#### *Summary of literature review, research objective and research questions*

Our literature review has established the increasing recognition of the complexity of the project environment (Cicmil et al. 2006; Crawford et al. 2006; Winter et al. 2006), and the criticality of interpersonal skills, including the need for collective sensemaking in project work. The technical and rational elements of the bodies of knowledge are an insufficient foundation for educating project managers (Cicmil et al. 2006; Crawford et al. 2006; Berggren & Söderlund 2008; Thomas & Mengel 2008; Cicmil & Gaggiotti 2018) and there remains a need to bridge “the gap between existing PM curricula and the reality of projects” (Leimbach & Goodall 2017, p. 71). As such, we seek to reduce this gap by designing a classroom-based approach that will help develop students collective sensemaking skills. Put more formally, our objective is:

*To prepare project managers for the human aspects of project work through a classroom-based approach to foster sensemaking abilities.*

In designing the approach we incorporated three components (explanation, demonstration, and application) that align with Merrill’s (2002) First Principles of Instruction.

The following research questions guide our evaluation of the educational approach:

*(a) How do the different components of the educational approach contribute to sensemaking understanding?*

*(b1) How do students’ levels of engagement relate to the level of understanding about the sensemaking process developed through the educational approach?*

*(b2) How do students' levels of engagement relate to changes in their thinking and awareness of sensemaking?*

Through answering these questions, we aim to provide a practical, empirical contribution to improve how we educate project managers to deal with the complex human aspects of project work through collective sensemaking.

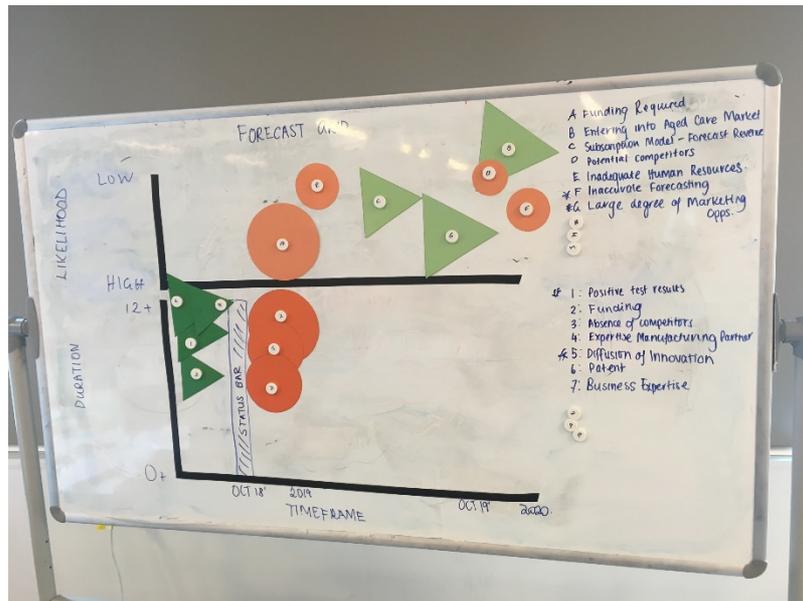
## Methodology

We pursued our research objective and answered our research questions through designing an educational approach and then assessing its impact through student surveys. The educational approach was assessed with two different student cohorts.

### *Educational approach design*

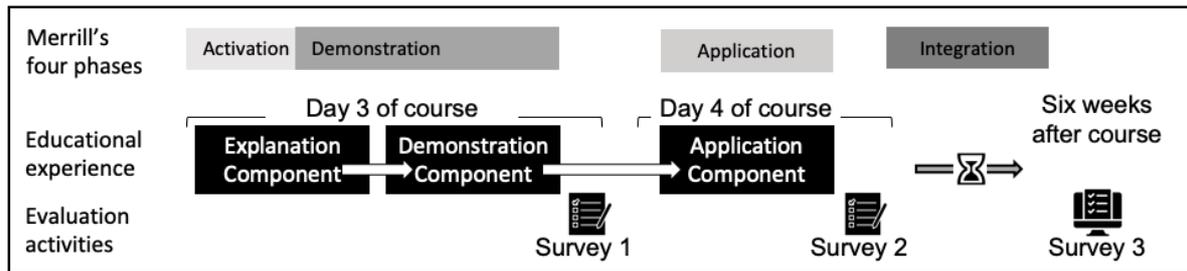
One tool that has been identified as supporting sensemaking in project work is the project-space model (van der Hoorn 2016a; van der Hoorn & Whitty 2017b), which visually represents the current and potential enablers and constraints to a project (van der Hoorn 2016a, 2016b). Central to the model's purpose is how it supports the process of collective sensemaking (van der Hoorn & Whitty 2017b). In our study the project-space model, with a tactile manifestation in terms of a whiteboard kit (see Figure 1), was central to the educational approach to support student's awareness of sensemaking.

**Figure 1: Whiteboard version of the project-space model (completed project-space model by a team in participating in the educational approach)**



The educational approach we designed was conducted in two 90-minute sessions during a four-day intensive course. Drawing upon Merrill's (2002) First Principles of Instruction, the approach included three components: (i) explanation; (ii) demonstration; and (iii) application. The first and second components were conducted in the first session on Day 3, and the third component in the second session on Day 4 (see Figure 2). We also aimed to ensure that the educational approach held students' attention and was perceived as worthwhile and enjoyable, to take advantage of possible correlations between positive emotions and better learning outcomes (Dalrymple et al. 2011; Finch et al. 2015; Killen 2015).

**Figure 2: Overview of the design of the educational approach**



The first session of the educational approach (on Day 3 of the course) started with an ‘explanation’ component that took approximately 45 minutes. It included an introduction to sensemaking and an explanation of the project-space model. The component commenced with a short interactive activity to reveal the variety of possible interpretations of the same situation or event and to activate student interest in sensemaking. Students read a short paragraph about a situation and then responded to a series of statements through a show of hands. Although the situation seemed relatively simple and everyone had the same information, students perceived the situation in different ways. This activity was designed to illustrate the challenges involved in facilitating sensemaking, and to appreciate that this challenge would be amplified for project teams in complex, dynamic environments. After reinforcing the necessity of being able to reconcile and make collective sense of differences when planning and taking action in project work, the educator discussed the benefits of visual tools in supporting cognitive function and the role of visuals in sensemaking. The project-space model was introduced as visual tool which can support this sensemaking process in project work by facilitating conversations.

After a short break, the first session continued with a 45-minute ‘demonstration’ component, which aligns with Merrill’s (2002) portrayal aspect within the demonstration process. The students were asked to read information about a fictitious case situation and then develop a

model for this case, which demonstrated the use of the project-space model. Students were asked to refer to the case description, which was approximately six pages long, and identify the actual and potential enablers and constraints to the project's progress (key features in the project-space model). The educator acted as a facilitator to draw input from the students, prompting them to debate differences in their perspectives and to agree on decisions required for representing the enablers and constraints on the project-space model (aspects such as the degree of impact duration, probability, and extent of impact). The educator demonstrated how an alternative method ('voting cards', similar to 'planning poker' in some agile environments) allows input from multiple people to be independently and quickly provided, thus initiating a debate to resolve differences when needed. Progressively, the project-space model for the case was developed on the whiteboard based on the collective sensemaking of the class. Throughout the 'demonstration' component, the educator highlighted differences in perspectives and ways to consider reconciling these perspectives.

The second session was conducted on the following day (Day 4 of the course). Students undertook a 90-minute 'application' component, which directly correlates with Merrill's (2002) application phase. Teams of five or six students developed a project-space model for a group project they had been working on throughout the four-day intensive course. The 'application' component enabled students to apply their learning from the previous day's session (the explanation and demonstration components) to a project in a largely self-organized and independent manner. [Reference removed] provides a full description of the educational approach summarized in this section.

### *Assessing the impact of educational approach (method)*

#### *Study participants*

The study participants were two cohorts of post-graduate students in a project management program in Australia. Cohort One consisted of 22 students, 15 of whom provided a complete response for all three surveys. Cohort Two contained 37 students, with 20 students providing a complete response for all three surveys. For both cohorts responses across the three surveys were matched through a unique identifier known only to the student. The students were fairly evenly split between male and female; all had work experience, with about half reporting more than eight years of work experience. They represented a wide range of industries, with experience in areas such as IT and telecommunications, research and commercialization, health, retail, construction, and digital media.

#### *Survey design and data collection*

The surveys elicited both qualitative and quantitative responses. Likert scaling was used for the quantitative responses; indeed, this response type is a common way of allowing a graded self-report of attitudes or beliefs about an idea or product (Frey 2018b). Previous studies which have used surveys for a similar purpose include those by Gu et al. (2017), who surveyed 56 students in relation to face-to-face versus online education, and Hussein (2015), who surveyed 64 students regarding including interactive games in project management education.

In this study the students were requested to complete surveys at three different stages – after each of the class sessions (on days 3 and 4) and a follow-up six weeks later (see Figure 2 and Table 1). Reflecting our overall objectives and research questions, the items in the surveys were focused on assessing the students' level of understanding; how each component contributed to their understanding, enjoyment, and engagement with the sessions; and whether their thinking and practice were impacted by the educational experience.

Participation in the three surveys was voluntary; however, students were given an incentive to participate, in that those who completed all three surveys had the opportunity to win a gift voucher. We recognize the limitations of indirect assessment of student learning (Suskie 2018): while some of the survey items attempted to assess students' recall and whether they could explain the model, and whether they had an increase in awareness relating to sensemaking in their work, the responses were based on the students' perceptions of this capability. Furthermore, while it was not possible to determine the actual changes in practice associated with the students' learning, we asked for open qualitative responses about whether they had spoken to others in their workplace or whether they had changed their work practices to gain insights into the impact of the learning.

**Table 1: Summary of survey instruments**

<b>Survey/ Feature</b>	<b>Survey 1</b>	<b>Survey 2</b>	<b>Survey 3</b>
<b>Timing:</b>	Immediately following explanation & demonstration components in class	Immediately following application component in class	Online survey, approximately six weeks after the educational experience
<b>Item themes:</b>			
<i>Understanding and recall related to project-space model (5-point Likert scale)</i>	Reflecting learning from the explanation & demonstration components	Reflecting the level of learning after the application component	Reflecting the learning retained since the educational experience
<i>Engagement and enjoyment (5-point Likert scale)</i>	Referring to explanation & demonstration components	Referring to application component	Referring back to the educational experience
<i>Thinking differently/appreciation of sensemaking (5-point Likert scale, and open response input added for Survey 3)</i>	Reporting thinking after explanation & demonstration components	Reporting thinking after all three components	Reporting thinking and reflections six weeks after the educational experience, plus open questions on influence/change in work practice
<i>Open response for any further comments</i>	Yes	Yes	Yes

#### *Data analysis*

Our analysis placed similar emphasis on both quantitative and qualitative responses. We paid particular attention to ensuring that all quantitative findings had face validity, and that the findings and constructs made sense and reflected the situation (Patton 2002). We reviewed and summarized the open-ended qualitative input and we include representative samples throughout our results section to support the quantitative results provided. In this way, qualitative analysis enhanced the confidence and ensured the relevance of the statistical findings.

Descriptive statistics, factor analysis, and correlations were used to analyze the Likert responses in the three surveys. We first used descriptive statistics to summarize responses to indicate the level of agreement (mean) and the spread of responses (standard deviation) (Frey

2018a). We used factor analysis to identify items that work together to represent higher level constructs (Ticehurst & Veal 1999), and Bivariate Pearson correlations to test relationships between the constructs and address questions (b1) and (b2).

## Results

### *Survey result summary*

Mean responses from the three surveys are presented in Table 2. A score of 5 on the Likert scale indicates strong agreement with the statement, while 1 indicates strong disagreement.

**Table 2: Mean responses from the three surveys (standard deviation in parentheses)**

Survey Item	Survey 1 (n=57)	Survey 2 (n=57)	Survey 3 (n=35)	Construct
1. I can recall enough about the Project Space Model to apply it in a small-medium-sized project (a project with a team of 4–8 people and budget of about \$20,000–\$300,000).	3.72 (0.95)	4.13 (0.81)	4.11 (0.80)	<b>UNDERSTAND</b> (two-item construct)
2. I believe I could explain the Project Space Model to others.	3.77 (0.89)	4.23 (0.76)	4.11 (0.68)	
3. I learned something new from the Project Space Model session.	4.32 (0.91)	4.16 (0.89)	4.29 (0.75)	<b>THINK</b> (three-item construct)
4. The Project Space Model caused me to think differently about projects and /or communications.	4.16 (0.92)	4.14 (0.88)	4.26 (0.82)	
5. The Project Space Model session has made me want to know more about sensemaking in projects.	4.23 (0.73)	4.20 (0.80)	4.20 (0.80)	
6. I found the Project Space Model engaging and it held my attention.	4.26 (0.74)	4.14 (0.96)	4.23 (0.73)	<b>ENGAGE</b> (three-item construct)
7. I enjoyed the Project Space Model session.	4.25 (0.72)	4.13 (0.92)	4.34 (0.59)	
8. I would recommend attending a Project Space Model to other project management students.	4.35 (0.86)	4.23 (0.87)	4.31 (0.68)	

Factor analysis of the responses from Survey 2 (after the application component was complete) revealed that the eight survey items loaded on three distinct factors. Three constructs were developed and used to test correlations. The constructs, UNDERSTAND, THINK and ENGAGE, are shown in the right-hand column in Table 2. See Appendix A for detail of the factor analysis and correlations.

*Students found all components of the approach to be valuable in developing their understanding of the concepts*

Responding to question (a) (*How do the different components of the educational approach contribute to sensemaking understanding?*), the surveys first assessed the degree to which each component of the approach developed the students' understanding of the project-space model. Each of the components attracted levels of agreement, as shown in Table 3. Students generally agreed or strongly agreed that each component contributed to their understanding. Even after students had already developed a level of understanding through the explanation and demonstration components, they agreed that the final component (application) helped further their understanding of the project-space model. The differences between the levels of agreement are not important or significant; what is important here is that each component was felt to be valuable in contributing to the understanding.

**Table 3: Mean responses on contribution to understanding from each component (standard deviation in brackets) (N=57)**

<b>Component &gt;</b>	<b>Explanation (on Survey 1)</b>	<b>Demonstration (on Survey 1)</b>	<b>Application (on Survey 2)</b>
The [component] helped me understand the method/model	4.07 (0.776)	4.46 (0.758)	4.19 (0.623)

Understanding about the project-space model was also gauged through responses about ability to use the model and to explain it to others. These responses were measured on each survey as shown in items 1 and 2 in Table 2. Responses revealed that the level of

understanding was developed over the two days of the educational experience. The application component on the fourth day strongly enhanced the understanding developed through the explanation and demonstration components on the previous day. This relationship is strongly demonstrated by students' increased degree of confidence in explaining the project-space model after applying it (increasing from 3.77 to 4.23, statistically significant at the 0.016 level). Although students retained a strong level of understanding, as indicated on the six-week follow up survey (for example 4.11, 'agree' for the ability to explain the project-space model), the level of understanding had dropped slightly.

The open-ended input also reinforced findings that combining the three components in the educational experience was useful in fostering the students' understanding of the project-space model:

Delivery of the project-space model was great – the practical application [in the demonstration] allowed me to gain a better understanding of its application. [Student 13, survey following explanation & demonstration session]

The theoretical and [demonstrated] application of the PSM has helped me its usefulness more clearly. [Student 37, survey following explanation & demonstration session]

Was very useful to be apply this to a case study we are familiar with. Helped to consolidate my understanding from presentation and demonstration on Day 3. [Student 9, survey following application session]

Working in small groups to apply the model works well to help understand the model. [Student 24, survey following application session]

I really like how it was taught. First, it was passive learning by teaching it to the whole class. After that, active learning by applying the PSM to the proposed project of each group. I feel that PSM will help recognize the negative and positive points in the project. [Student 42, survey following application session]

The PSM session was very practical ... the [application] session was very realistic and I felt confident about applying it to real life. [Student 39, survey six-week follow-up]

In summary, our result in terms of research question (a) reveals that the three educational components (explanation, demonstration, and application) each contributed to the development of sensemaking understanding.

### *Exploring the relationship between understanding, thinking and engagement*

This section addresses the following research questions:

*(b1) Do students' levels of engagement relate to the level of understanding about the sensemaking process developed through the educational approach?*

*(b2) Do students' levels of engagement relate to changes in their thinking and awareness of sensemaking?*

*Students found that the educational approach held attention, was enjoyable and worthwhile [ENGAGE]*

Three items in each survey focused on the student's engagement with the experience. Items 6, 7 and 8 in Table 2 asked students whether the session held their attention and was enjoyable, and whether they would recommend the session to other students (i.e., it was perceived to be worthwhile). The results show the mean response was between strongly agree and agree, with no students disagreeing with these statements after the class sessions. Factor analysis revealed that these three items loaded on a single factor. We created a three-item construct (ENGAGE) to further explore the relationships identified in (b1) and (b2). The strong level of engagement was supported by comments such as:

The delivery of the information was engaging, new learning. [Student 8, survey following explanation & demonstration session]

Overall I had a great learning experience and I learnt something very new. [Student 39, survey six-week follow-up]

*Student developed understanding about the sensemaking process [UNDERSTAND]*

As previously discussed, students developed their understanding about the sensemaking process through the three components of the educational approach. The understanding was evaluated through students' reported ability to recall the information and to explain it to others (items 1 and 2 in Table 2). These two items form a distinct factor, reflected in the construct UNDERSTAND. Open-ended responses provide further insights into the development of understanding about the sensemaking process, and how students were able to use the tool in their workplace.

I think that [the opportunity to apply the learning] helped me understand it more but also helps me to remember how to use it. [Student 5, survey following application session]

The way the project-space model was taught made it clear and easy to apply in the group session ... The method and approach on how this subject was taught should be used in other project subjects. [Student 13, survey following application session]

I find that the model is great for the team meeting ... it brings a visual element and helps the team discussion. [Student 29, survey six-week follow up]

*Students reported changes to their thinking about projects and sensemaking [THINK]*

To assess impact, items 3, 4 and 5 in Table 2 captured students' perception about whether they had learned something new, or whether their thinking about projects had been changed. The strength of agreement about learning something new was highest in the first survey. Although agreement was still strong, reported levels of new learning dropped somewhat in the second survey, when the concept of the project-space model was no longer new and much learning had already taken place. These findings reinforce that learning was developed through multiple components of the educational approach. Factor analysis revealed that these three items loaded on a single factor. We created a three-item construct (THINK) to further explore the relationships identified in (b1) and (b2). Open-ended comments also reflect how the approach contributed to new understandings about project work:

The project-space model helps us to discuss deeply about our project.  
[Student 10, survey following application session]

The PSM has effectively create a sense of awareness in the project. [Student 46, survey following application session]

It changed my perception of understanding problems and opportunities in a more logical manner. [Student 50, survey following explanation & demonstration session]

The results demonstrate a shift in perspective during the educational experience. For example, in the first survey following the explanation and demonstration session, Student 1 commented:

I found this model interesting and helpful in certain types of situations. However, I have some doubts about how pragmatic it can be in complex environment projects ...

However, on the second survey after the application session, the same student commented:

It is a good way to start a group conversation and discuss topics as a group. I reckon is visually useful to at least identify issues of a project, but also can open a door to debate think in a “disordered way” depending on team characteristics.

#### *Correlations between ENGAGE, UNDERSTAND and THINK*

We used the results from Survey 2, conducted after the final session of the educational approach, to evaluate questions (b1) and (b2). The findings address (b1) and (b2) and show strong correlations between the students’ engagement and their development of understanding of the sensemaking process (0.441, sig 0.001) and between the students’ engagement and the resultant changes to their thinking (0.791, sig 0.000).

#### *Students were more aware of sensemaking in project work and felt more capable to deal with sensemaking situations*

Finally, we refer back to our objective of designing and evaluating an educational approach in order to foster students’ ability to facilitate collective sensemaking in project work. Our quantitative findings for all questions demonstrate progress toward our main objective by

showing that an educational approach can employ multiple components to progressively foster understanding, and that an engaging activity is related to changes in understanding and thinking. Further to those findings, the responses to the follow-up survey (Survey 3) provide additional insight into the impact of the educational approach. The results show that the students became more aware of sensemaking and multiple perspectives in project work, and that the learning was beginning to make an impact on work practices for some students.

Responses from students currently working in project environments demonstrated the practical impact of the educational approach. Nearly half of the students who completed the follow-up survey worked in a project environment (48.6%), and these students showed higher levels of impact in the weeks following the class sessions. They were much more likely to report that they had spoken to other people about the project-space model than did the students who did not work in project environments (82.3%, compared with 55.6%).

Examples of students' integration of the learning into their work practice include:

[I] discussed with my project team and senior management about the model, ... and what we can do to change current ways of working to become more efficient. [Student 13, survey six-week follow-up]

[the PSM is useful] when putting risks into perspective for executives, to draw their attention to the bigger risk. [Student 33, survey six-week follow-up]

In addition, about one-third of students who were working in a project environment reported changes in their work practices stemming from the new insights about the sensemaking process. The change in work practices, reported only six weeks after the class session, demonstrates a real and practical impact of the session. One example:

[How has your practice changed?]: Engaging management differently. Realized one executive was more visual – so have been drawing a lot of responses. The visual diagram stating that we have done this process ... so

many times, has really helped engagement and communication. [Student 3, survey six-week follow-up]

However, the feedback also indicated some of the difficulties in making changes and adopting new tools. After acknowledging that the project-space model seemed useful and valuable, one student highlighted the difficulties this way:

I reckon that in complex, bureaucratic organizations, where different power levels are present among the members, the adoption of these tools can provoke contention, and the effect may generate more tension between the parties instead of helping to have clarity regarding sensemaking. [Student 1, survey six-week follow-up]

Overall our results suggest that the educational approach we designed was successful in fostering students' ability to apply sensemaking in project work. High levels of understanding, changes to thinking and the impact on work practices provide evidence of that success. Our results also demonstrate how the three components each contributed to developing understanding in response to question (a), and that engagement is positively correlated with changes to understanding in response to question (b1) and with changes to thinking in response to question (b2).

## Discussion

Our primary contribution is to the discourse regarding the need to prepare project managers for the realities of project work (see, for example, Alam et al. (2010); Syed et al. (2010); Turner (2016)). This study addressed that need through the design and evaluation of a multi-faceted educational approach that introduced students to the concept of collective sensemaking. We found that each component of the educational approach contributed to student understanding about sensemaking, and that students developed awareness and changed their thinking through the components of the educational approach. In addition to

providing an example of a collective sensemaking class, we propose that the three-component structure is likely to be effective when teaching other interpersonal skills.

An additional contribution is the demonstration of how we can diffuse contemporary project management thinking into practice through education. As posited by Walker and Lloyd-Walker (2016), research is increasingly proposing new thinking and tools, but we need to enable those in practice to benefit from these contemporary perspectives. The educational approach described in this study is an exemplar of how contemporary project management thinking can be dispersed into practice.

*Primary contribution: Preparing project managers for the human aspects of project work*

*Fostering sensemaking abilities in the classroom*

The primary contribution of this research is the description and evaluation of an educational approach that helps to prepare project managers for the realities of project work. We present our design and evaluation of an impactful educational approach to teach project management students about sensemaking. We show how a sensemaking tool, such as the project-space model, can be incorporated into a post-graduate classroom as a device around which to craft an educational approach that fosters sensemaking understanding and ability. This is an important practical contribution, given that the literature has called for examples of educational approaches that attend to the more human aspects of project work (Sewchurran 2008; Stevenson & Starkweather 2010; Ramazani & Jergeas 2015) and demonstrate the inherent complexity of organizational life (Crawford et al. 2006; Thomas & Mengel 2008; Ramazani & Jergeas 2015). Through our study, we extend empirical research by equipping educators with an approach to foster students' interpersonal skills.

*The importance of instruction, demonstration, and application elements in interpersonal skills development*

The findings of this study suggest that student learning is fostered through the cumulative combination of explanation, demonstration, and application components. This supports assertions in the literature, such as in Merrill's (2002) First Principles of Instruction, on the benefits of a multiple component approach. The students strongly agreed that each component had a positive impact on understanding, even when a high level of understanding had already been developed. The students reported high levels of confidence in applying or explaining the concepts after the explanation and demonstration components, and then continued to develop significantly higher levels of confidence through the application component, where they developed experience using the model. The fact that the students' understanding and confidence continued to develop aligns with their agreement that each component contributed to their understanding, and strengthens our findings.

Our results have practical implications for teaching interpersonal skills to emerging project managers more broadly. Our findings support the use of the First Principles of Instruction (Merrill 2002) as a foundation for developing interpersonal skills. We thus extend the discourse on project management education by providing empirical evidence about the role of explanation, demonstration, and application components in fostering the interpersonal skills recognized as being needed by project managers. These findings can also inform the design of other educational approaches to foster students' skills in the human aspects of project work.

*Additional contribution: Diffusing contemporary perspectives and tools to practice through education*

*Introducing practitioners to new tools*

Svejvig and Andersen (2015) identify a need to diffuse into practice the new ways of thinking about projects and project management. Similarly, Walker and Lloyd-Walker (2016) provoke researchers to ensure their work benefits practitioners. Project management education is often characterized by a positivist grounding aligned with the foundations of much of the traditional project management thinking (see, for example, Whitty (2011) on the positivist grounding of dominant project management perspectives). Our study explored the delivery of education about a topic, sensemaking, which acknowledges the complex nature of negotiating understanding in project work. The educational approach introduced the students to a tool that provides an alternative to the traditional toolkit provided by the bodies of knowledge.

The need for practitioners to leverage a wide variety of tools is highlighted in discussions about the need to consider alternative approaches to, and tools for, project work (Remington & Pollack 2007; van der Hoorn & Whitty 2016a) and approaches that reflect the ‘lived experience’ of practitioners (Cicmil et al. 2006). If we are to shift practitioner mindsets and practice we must provide practitioners with education in tools and processes that embody contemporary research perspectives. Through this study we provide a practical example of how new tools and processes can be incorporated into classroom-based education. Our finding that about a third of students working in projects reported changes to their work practices following the experience demonstrates the ways that an educational approach can result in practical impact.

*Engaging educational approaches change thinking*

Our findings highlight the significance of engagement for learning. We answer question (b2) by showing that students who report higher levels of engagement with the educational

approach are more likely to experience changes in their thinking about project work. This has practical implications for the design of project management classes, strengthening findings from other studies (Dalrymple et al. 2011; Finch et al. 2015; Clegg et al. 2018) that suggest designing approaches that hold student attention, are enjoyable, and are perceived as worthwhile will improve learning outcomes. We urge educators to consider these correlations when designing classes to foster interpersonal skills and new ways of thinking about project work.

#### *Limitations and future research opportunities*

Our study has limitations, some of which indicate future research opportunities. First, our study is limited to one project management program in Australia. Further trialling of this educational approach in different countries and more diverse cohorts could evaluate the extensibility and generalizability of the results. There are also the limitations in any perception-based study; students' *perception* of their understanding and recall, and potential changes in their view of project work, may not accurately reflect the impact. Future research could seek to provide ways to triangulate perceptions with other data and offer more definitive comparisons of how the students' practices may have changed as a result of an educational approach.

Finally, we have tested only one educational approach to embed collective sensemaking into a project management course, with 57 students participating in the classroom segments and completing the first two surveys, and 37 of those also completing the six-week follow-up survey. Future studies with larger sample sizes could reveal further relationships and offer higher levels of confidence. Such studies could compare different ways of teaching collective sensemaking and consider different types of courses and types of students (for example, full-

time students compared with those currently working in project environments) to determine the techniques best suited to particular students.

## Conclusion

This study contributes to the project management education discourse, specifically the calls to prepare project managers for the human aspects of project work. There is broad agreement that education in the technical and rational aspects of the discipline is insufficient for coping with the realities of project work, and that interpersonal skills are critical to practice. Our study addresses these needs by providing an example of an impactful educational approach that will assist educators to incorporate alternative tools and perspectives and to develop sensemaking skills. In doing so, we advance the discourse beyond broad statements about the importance of including ideas such as complexity, interpersonal skills, and reflection-in-practice in project management education.

Our primary contribution is the demonstration of an effective educational approach for developing collective sensemaking abilities in project managers. Through a series of surveys across a sample of 57 students we reveal connections between educational design, the development and retention of learning, and the flow-on effect on practice. We show how Merrill's (2002) First Principles of Instruction support the use of three sequential components – explanation, demonstration, and application – to progressively build sensemaking awareness and capabilities in a classroom setting. Our follow-up with students six weeks after the classroom experience revealed that the understanding developed in the classroom was retained over time and influenced project management practice.

The evidence of influence on practice from the educational approach is a highlight of this study, underscoring the effect of the educational experience on the development of practical real-world abilities. After all, improving practice is an important outcome of education in practice-based fields such as project management. In addition, the evidence on the retention of learning, shifts in thinking, and influence on practice underpins an important additional contribution from this study: the introduction of new perspectives and tools into project management practice.

It is imperative that education prepares project managers for the reality of their work. We have demonstrated how a novel educational approach equips practitioners to facilitate collective sensemaking. Our contributions answer the calls to incorporate new streams of thinking into project management education and practice, especially contemporary perspectives that acknowledge the human aspects of project managing.

## Appendix A

**Table A1: Factor analysis and constructs.**

Rotated component matrix, small coefficient values (<0.2) suppressed.

Item Number and short name	Construct name and components (in bold)		
	<b>ENGAGE</b> Cronbach alpha 0.857	<b>THINK</b> Cronbach alpha 0.725	<b>UNDERSTAND</b> Cronbach alpha 0.822
1. RECALL			<b>0.923</b>
2. EXPLAIN			<b>0.906</b>
3. ENGAGE	<b>0.864</b>		
4. ENJOY	<b>0.816</b>		0.207
5. RECCOMEND	<b>0.808</b>	0.240	
6. LEARN		<b>0.858</b>	
7. THINK	0.463	<b>0.701</b>	
8. KNOW_MORE		<b>0.913</b>	

**Table A2: Pearson correlations between engagement and the development of understanding and changes in thinking (Survey 2).**  
(two-tailed analysis, N=57)

	<b>UNDERSTAND</b>	<b>THINK</b>
<b>ENGAGE</b>	0.441 (sig 0.001)	0.791 (sig 0.000)

## Reference list

- Alam, M, Gale, A, Brown, M & Khan, AI 2010, 'The importance of human skills in project management professional development', *International Journal of Managing Projects in Business*, vol. 3, no. 3, pp. 495-516.
- Alderman, N & Ivory, C 2011, 'Translation and convergence in projects: An organizational perspective on project success', *Project Management Journal*, vol. 42, no. 5, pp. 17-30.
- Ancona, D 2012, 'Sensemaking: Framing and acting into the unknown', in S Snook, et al. (eds), *The handbook for teaching leadership: Knowing, doing, and being*, Sage Publications Inc., USA.
- Andersen, ES 2010, 'The X model - a tool for describing and assessing individual projects', *International Journal of Managing Projects in Business*, vol. 3, no. 3, pp. 369-86.
- Atkinson, R, Crawford, L & Ward, S 2006, 'Fundamental uncertainties in projects and the scope of project management', *International Journal of Project Management*, vol. 24, no. 8, pp. 687-98.
- Berggren, C & Söderlund, J 2008, 'Rethinking project management education: Social twists and knowledge co-production', *International Journal of Project Management*, vol. 26, no. 3, pp. 286-96.
- Bredillet, C 2010, 'Blowing hot and cold on project management', *Project Management Journal*, vol. 41, no. 3, pp. 4-20.
- Brière, S, Proulx, D, Flores, ON & Laporte, M 2015, 'Competencies of project managers in international NGOs: Perceptions of practitioners', *International Journal of Project Management*, vol. 33, no. 1, pp. 116-25.
- Brunet, M & Forgues, D 2019, 'Investigating collective sensemaking of a major project success', *International Journal of Managing Projects in Business*, vol. 12, no. 3, pp. 644-65.
- Caniëls, MCJ, Chiochio, F & van Loon, NPAA 2019, 'Collaboration in project teams: The role of mastery and performance climates', *International Journal of Project Management*, vol. 37, no. 1, pp. 1-13.
- Cicmil, S & Gaggiotti, H 2018, 'Responsible forms of project management education: Theoretical plurality and reflective pedagogies', *International Journal of Project Management*, vol. 36, no. 1, pp. 208-18.
- Cicmil, S, Williams, T, Thomas, J & Hodgson, D 2006, 'Rethinking project management: Researching the actuality of projects', *International Journal of Project Management*, vol. 24, no. 8, pp. 675-86.

Clegg, S, Killen, C, Biesenthal, C & Sankaran, S 2018, 'Practices, projects and portfolios: Current research trends and new directions', *International Journal of Project Management*, vol. 36, no. 5, pp. 762-72.

Collis, B & Margaryan, A 2005, 'Design criteria for work-based learning: Merrill's First Principles of Instruction expanded', *British Journal of Educational Technology*, vol. 36, no. 5, pp. 725-38.

Crawford, L 2006, 'Developing organizational project management capability: Theory and practice', *Project Management Journal*, vol. 37, no. 3, pp. 74-86.

Crawford, L, Morris, P, Thomas, J & Winter, M 2006, 'Practitioner development: From trained technicians to reflective practitioners', *International Journal of Project Management*, vol. 24, no. 8, pp. 722-33.

Dalrymple, OO, Sears, DA & Evangelou, D 2011, 'The Motivational and Transfer Potential of Disassemble/Analyze/Assemble Activities', *Journal of Engineering Education*, vol. 100, no. 4, pp. 741-59.

Finch, D, Peacock, M, Lazdowski, D & Hwang, M 2015, 'Managing emotions: A case study exploring the relationship between experiential learning, emotions, and student performance', *The International Journal of Management Education*, vol. 13, no. 1, pp. 23-36.

Frey, B 2018a, *Descriptive statistics*, Thousand Oaks, California, <<http://methods.sagepub.com/reference/the-sage-encyclopedia-of-educational-research-measurement-and-evaluation>>.

Frey, B 2018b, *Likert scaling*, Thousand Oaks,, California, <<http://methods.sagepub.com/reference/the-sage-encyclopedia-of-educational-research-measurement-and-evaluation>>.

Frick, TW, Chadha, R, Watson, C, Wang, Y & Green, P 2009, 'College student perceptions of teaching and learning quality', *Educational Technology Research and Development*, vol. 57, no. 5, pp. 705-20.

Gacasan, EMP & Wiggins, MW 2017, 'Sensemaking through cue utilisation in disaster recovery project management', *International Journal of Project Management*, vol. 35, no. 5, pp. 818-26.

Gebauer, A 2012, 'Mindful Organizing as a Paradigm to Develop Managers', *Journal of Management Education*, vol. 37, no. 2, pp. 203-28.

Gu, Q, Li, K, Smith, S & Jitpaiboon, T 2017, 'Teaching Project Management: Online versus face-to-face', *Journal of Supply Chain and Operations Management*, vol. 15, no. 3, pp. 228-40.

Havermans, LA, Keegan, A & Den Hartog, DN 2015, 'Choosing your words carefully: Leaders' narratives of complex emergent problem resolution', *International Journal of Project Management*, vol. 33, no. 5, pp. 973-84.

Hoezen, M, Voordijk, H & Dewulf, G 2013, 'Formal bargaining and informal sense making in the competitive dialogue procedure', *International Journal of Managing Projects in Business*, vol. 6, no. 4, pp. 674-94.

Hussein, B 2015, 'A Blended Learning Approach to Teaching Project Management: A Model for Active Participation and Involvement: Insights from Norway', *Education Sciences*, vol. 5, no. 2, p. 104.

Jerbrant, A & Karrbom Gustavsson, T 2013, 'Managing project portfolios: balancing flexibility and structure by improvising', *International Journal of Managing Projects in Business*, vol. 6, no. 1, pp. 152-72.

Karrbom Gustavsson, T & Hallin, A 2014, 'Rethinking dichotomization: A critical perspective on the use of "hard" and "soft" in project management research', *International Journal of Project Management*, vol. 32, no. 4, pp. 568-77.

Keil, M, Lee, HK & Deng, T 2013, 'Understanding the most critical skills for managing IT projects: A Delphi study of IT project managers', *Information & Management*, vol. 50, no. 7, pp. 398-414.

Killen, C 2015, 'Three dimensions of learning: experiential activity for engineering innovation education and research', *European Journal of Engineering Education*, vol. 40, no. 5, pp. 476-98.

Lee, S & Koszalka, TA 2016, 'Course-level implementation of First Principles, goal orientations, and cognitive engagement: a multilevel mediation model', *Asia Pacific Education Review*, vol. 17, no. 2, pp. 365-75.

Leimbach, T & Goodall, JB 2017, 'The relation between project management education and newer streams in project management research', in MRP Hansen & J Pries-Heje (eds), *Future of Project Management*, Roskilde University, pp. 65-74.

Liang, N & Wang, J 2004, 'Implicit Mental Models in Teaching Cases: An Empirical Study of Popular MBA Cases in the United States and China', *Academy of Management Learning & Education*, vol. 3, no. 4, pp. 397-413.

Lindgren, M & Packendorff, J 2006, 'Projects and prisons', in DE Hodgson & S Cicmil (eds), *Making projects critical*, Palgrave Macmillan, Basingstoke England, pp. 111-31.

Live Vaagaasar, A 2011, 'Development of relationships and relationship competencies in complex projects', *International Journal of Managing Projects in Business*, vol. 4, no. 2, pp. 294-307.

Lo, CK, Lie, CW & Hew, KF 2018, 'Applying "First Principles of Instruction" as a design theory of the flipped classroom: Findings from a collective study of four secondary school subjects', *Computers & Education*, vol. 118, pp. 150-65.

Louw, T & Rwelamila, PD 2012, 'Project Management Training Curricula at South African Public Universities: Is the Balanced Demand of the Profession Sufficiently Accommodated?', *Project Management Journal*, vol. 43, no. 4, pp. 70-80.

Martinsuo, M & Killen, C 2014, 'Value management in project portfolios: Identifying and assessing strategic value', *Project Management Journal*, vol. 45, no. 5, pp. 56-70.

Merrill, MD 2002, 'First principles of instruction', *Educational technology research and development*, vol. 50, no. 3, pp. 43-59.

Merrill, MD 2009, 'First principles of instruction', in CM Reigeluth & AA Carr-Chellman (eds), *Instructional-Design Theories and Models, Volume III : Building a Common Knowledge Base*, Routledge, New York, pp. 41-56.

Merrill, MD 2012, *First principles of instruction*, John Wiley & Sons, San Francisco.

Ojiako, U, Chipulu, M, Marshall, A, Ashleigh, MJ & Williams, T 2015, 'Project management learning: A comparative study between engineering students' experiences in South Africa and the United Kingdom', *Project Management Journal*, vol. 46, no. 4, pp. 47-62.

Pant, I & Baroudi, B 2008, 'Project management education: The human skills imperative', *International Journal of Project Management*, vol. 26, no. 2, pp. 124-8.

Papadimitriou, K & Pellegrin, C 2007, 'Dynamics of a project through Intermediary Objects of Design (IODs): A sensemaking perspective', *International Journal of Project Management*, vol. 25, no. 5, pp. 437-45.

Paton, S, Chia, R & Burt, G 2013, 'Relevance or 'relevate'? How university business schools can add value through reflexively learning from strategic partnerships with business', *Management Learning*, vol. 45, no. 3, pp. 267-88.

Patton, M 2002, *Qualitative Research and Evaluation Methods*, Sage Publications, United States.

Ramazani, J & Jergeas, G 2015, 'Project managers and the journey from good to great: The benefits of investment in project management training and education', *International Journal of Project Management*, vol. 33, no. 1, pp. 41-52.

Remington, K & Pollack, J 2007, *Tools for complex projects*, Gower Pub, Farnham England.

Sewchurran, K 2008, 'Toward an approach to create self-organizing and reflexive information systems project practitioners', *International Journal of Managing Projects in Business*, vol. 1, no. 3, pp. 316-33.

Sewchurran, K & Barron, M 2008, 'An investigation into successfully managing and sustaining the project sponsor–project manager relationship using soft systems methodology', *Project Management Journal*, vol. 39, pp. S56-S68.

Söderlund, J & Müller, R 2014, 'Project Management and Organization Theory: IRNOP Meets PMJ', *Project Management Journal*, vol. 45, no. 4, pp. 2-6.

Stevenson, DH & Starkweather, JA 2010, 'PM critical competency index: IT execs prefer soft skills', *International Journal of Project Management*, vol. 28, no. 7, pp. 663-71.

Sunindijo, RY 2015, 'Project manager skills for improving project performance', *International Journal of Business Performance Management*, vol. 16, no. 1, pp. 67-83.

Suskie, L 2018, *Assessing student learning: A common sense guide*, John Wiley & Sons, San Fransisco.

Svejvig, P & Andersen, P 2015, 'Rethinking project management: A structured literature review with a critical look at the brave new world', *International Journal of Project Management*, vol. 33, no. 2, pp. 278-90.

Syed, A, Andy, G, Therese, LW, Richard, K, Ali, K & Mehmood, A 2010, 'The importance of soft skills in complex projects', *International Journal of Managing Projects in Business*, vol. 3, no. 3, pp. 387-401.

Thiry, M 2001, 'Sensemaking in value management practice', *International Journal of Project Management*, vol. 19, no. 2, pp. 71-7.

Thiry, M 2002, 'Combining value and project management into an effective programme management model', *International Journal of Project Management*, vol. 20, no. 3, pp. 221-7.

Thomas, J & Mengel, T 2008, 'Preparing project managers to deal with complexity – Advanced project management education', *International Journal of Project Management*, vol. 26, no. 3, pp. 304-15.

Ticehurst, GW & Veal, AJ 1999, *Business Research Methods: A Managerial Approach*, Longman, Sydney.

Tu, W & Snyder, MM 2017, 'Developing conceptual understanding in a statistics course: Merrill's First Principles and real data at work', *Educational Technology Research and Development*, vol. 65, no. 3, pp. 579-95.

- Turner, M 2016, 'Beyond the iron triangle: reflections of an early career academic', *International Journal of Managing Projects in Business*, vol. 9, no. 4, pp. 892-902.
- van der Hoorn, B 2016a, 'The Project-space Model: Visualising the enablers and constraints for a given project', *International Journal of Project Management*, vol. 34, no. 2, pp. 173-86.
- van der Hoorn, B 2016b, 'Discussing project status with the project-space model: an action research study', *International Journal of Project Management*, vol. 34, no. 8, pp. 1638-57.
- van der Hoorn, B 2018, 'Reflections on the PhD thesis: Exploring the “lived experience” of project work with Continental philosophical perspectives', *International Journal of Managing Projects in Business*, vol. 11, no. 3, pp. 673-86.
- van der Hoorn, B & Whitty, S 2016a, 'Projectyness: A spectrum of greater or lesser capability', *International Journal of Project Management*, vol. 34, no. 6, pp. 970-82.
- van der Hoorn, B & Whitty, S 2016b, 'Let's discuss aesthetics for projects', *Project Management Journal*, vol. 47, no. 3, pp. 63 - 76.
- van der Hoorn, B & Whitty, S 2017a, 'The praxis of ‘alignment seeking’ in project work', *International Journal of Project Management*, vol. 35, no. 6, pp. 978-93.
- van der Hoorn, B & Whitty, S 2017b, 'The project-space model: A tool for sensemaking in projects', *International Journal of Managing Projects in Business*, vol. 10, no. 1, pp. 185-202.
- Walker, D & Lloyd-Walker, B 2016, 'Rethinking project management: Its influence on papers published in the international journal of managing projects in business', *International Journal of Managing Projects in Business*, vol. 9, no. 4, pp. 716-43.
- Walker, D & Lloyd-Walker, B 2018, 'The future of the management of projects in the 2030s', *International Journal of Managing Projects in Business*, vol. Early cite.
- Walker, D, Steinfors, P & Maqsood, T 2014, 'Stakeholder voices through rich pictures', *International Journal of Managing Projects in Business*, vol. 7, no. 3, pp. 342-61.
- Weick, KE 2001, *Making sense of the organisation*, Blackwell Publishing, Oxford.
- Weick, KE, Sutcliffe, KM & Obstfeld, D 2005, 'Organizing and the process of sensemaking', *Organization Science*, vol. 16, no. 4, pp. 409-21.
- Whitty, SJ 2011, 'On a new philosophy of project management: An investigation into the prevalence of modern project management by means of an evolutionary framework', *International Journal of Managing Projects in Business*, vol. 4, no. 3, pp. 524-33.

Winter, M, Smith, C, Morris, P & Cicmil, S 2006, 'Directions for future research in project management: The main findings of a UK government-funded research network', *International Journal of Project Management*, vol. 24, no. 8, pp. 638-49.

Zuo, J, Zhao, X, Nguyen, QBM, Ma, T & Gao, S 2018, 'Soft skills of construction project management professionals and project success factors: a structural equation model', *Engineering, Construction and Architectural Management*, vol. 25, no. 3, pp. 425-42.