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Author

Hattingh, Andre, Hodge, Steven, Mavin, Timothy

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Flight instructor perspectives on competency-based education: insights into educator practice within an aviation context.

Andre Hattingh, Steven Hodge & Timothy Mavin

School of Education and Professional Studies, Griffith University, Mt Gravatt, Australia

For correspondence, contact Andre at andre.hattingh@alumni.griffithuni.edu.au

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Abstract

This paper investigates how flight instructors view the utility of competency-based education/training (CBE/T) during the training of new pilots. A total of ten flight instructors were interviewed and analysed through an interpretive paradigm of grounded theory. The findings indicate flight instructors of all experience levels have difficulty engaging with competency texts and have a limited theoretical understanding of CBE/T. The findings suggest possible incorrect practises are being employed by instructors. More importantly, the study highlights a concern that the current industry understanding of CBE/T directly relates to learning and safety, with a potential for negative outcomes. The paper questions if CBE/T is an appropriate model for training new pilots.

Keywords: competency-based education; competency-based training; vocational education; flight instructor

Introduction

The Civil Aviation Safety Authority (CASA) is the Australian aviation regulatory body. Their function is to support Australian aviation through issuing of licences, aircraft registrations, and providing regulatory oversight and guidance for industry operations. Ultimately, CASA's function is to oversee and promote safety. As part of a global community, CASA receives guidance from the International Civil Aviation Organisation. While not a global regulatory

body, the International Civil Aviation Organisation provides guidance to its 193 member states, including Australia, through international collaboration, for the purpose of global standards and safety (ICAO, n.d.).

New pilots in Australia receive ground and flight instruction from educational providers (e.g., flying schools) for the purpose of obtaining a pilot licences and other qualifications. The linear progression in licencing in some contexts are Private Pilot Licence, Commercial Pilot Licence and Airline Transport Pilot Licence. The focus of this paper considers training from the ab-initio phase (i.e., initial flight training) up to Commercial Pilot licence.

Pilot training includes both theoretical-and-practical aspects. Early flight training towards the Commercial Pilot Licence occurs in light single-engine aircraft. Ground school, which encompasses theoretical aeronautical knowledge, is completed at specific points and may, or may not, coincide with flight instruction training. For example, prior to completing CASA exams students will generally receive traditional classroom-based teaching on specific subjects like meteorology or aerodynamics. Theoretical exams are multiple-choice with pass marks ranging from 70% to 80%. On the other hand, during flight training, instructors will generally include ground instruction on the practical knowledge aspects of each flight. For instance, prior to commencing navigational exercises to other airports, practical knowledge on navigation will be taught. Here, assessments are made through the observation of learner performance. In short, flight training since 1999 is competency-based training/education (CBE/T) mixed with traditional approaches to teaching theoretical knowledge.

In 1999 CASA provided guidance material on how to implement CBE/T through the Day Visual Flight Rules syllabus (CASA, 1999). In 2009 further guidance was introduced through another industry publication (CASA, 2009). Fundamentally, this publication, while not enforceable, provided advice to flying schools and flight instructors on preferred methods

to comply with CASA regulations, including competency documents (CASA, 2009, p.1). In 2014, CASA replaced previous regulations with the new Part 61 Manual of Standards (hereinafter Part 61) (Australian Government, 2014). However, the change did not amend the requirement for CBE/T, nor was any updated publications released. Unfortunately, the implementation of CBE/T together with inconsistencies found in industry guidance-and-regulatory documents mirror a misunderstanding on CBE/T within the Australian aviation industry. In summary, since 1999, aspiring pilots are taught under the banner of CBE/T. Yet, there has been little research into how effective this transition to CBE/T has been.

The use of Competency-based education/training

The broad use of CBE/T

There appears to be little consensus on the definition of CBE/T (Day, 2017; Hagar, 2017; Hodge et al., 2020; Vonken, 2017). More significantly, there is still questions relating to how to ultimately measure competent performance (Day, 2017; Franks et al., 2014; Hagar, 2017; Kearns et al., 2016; Lassnigg, 2017; Vonken, 2017; Wuttke, & Seifried, 2017). For example, even though competencies are the reference point for designing learning activities across a broad range of professions, there is an argument that it is not always possible to concisely textualize competence, and inversely, it is not possible to accurately interpret competency texts (Hodge et al., 2020). Furthermore, it has been suggested that CBE/T tends to disconnect learners from critical aspects of knowledge, such as the theoretical systems of meaning (Wheelahan 2009; 2016; 2019). The imprecise understanding of CBE/T, possible issues associated with the design and interpretation of competency texts, and how it can remove the learner, has added much complexity and challenges for educators during implementation (Hodge et al., 2020; Kearns et al., 2016).

Research from the Vocational Education and Training sector demonstrates the difficulties educators face in interpreting competencies which challenges assumptions made by CBE/T and the vocational sector (Hodge, 2017; Kearns et al., 2016). Moreover, effective interpretation includes a process of carefully considering the intention of authoritative texts and developing an understanding of what is required during implementation (Hodge et al., 2020). This not only includes a careful and unbiased reading of texts but also a clear understanding of how the competency unit's structural components work together during interpretation and implementation (Kearns et al., 2016). Other research also indicated that there is a general lack of understanding, for educators, with regards to CBE/T (Lowrie et al., 1999; Smith, 2010). These issues were found to be true for even experienced educators and for those with relevant industry-required training-and-assessment qualifications (Hodge, 2017; Lowrie et al., 1999; Smith, 2010).

To overcome the challenges educators face, considering the limitations of CBE/T, some authors have suggested that organisations provide adequate workplace learning and professional development for staff (Billett & Choy, 2013; Franks et al., 2014; Hagar, 2017). A proposal for improving the implementation of CBE/T was made by Kearns et al., (2016). They suggest three questions that should be answered that relate to the use of CBE/T. These questions focus on how competencies and texts are understood, combined, and used. Furthermore, much theoretical work has been done to propose a more holistic approach to CBE/T that targets specific domains that develop learner attributes such as critical thinking and problem solving (Billett, 2017; Hagar, 2017; Mulder, & Winterton, 2017).

There are several weaknesses found, relating to the utility of CBE/T, in the current Australian aviation context. To illustrate specific weaknesses, during the discussion, the 'competence approach' created by Hodge et al., (2020, p. 36) will be used as a reference point (see Fig. 1).

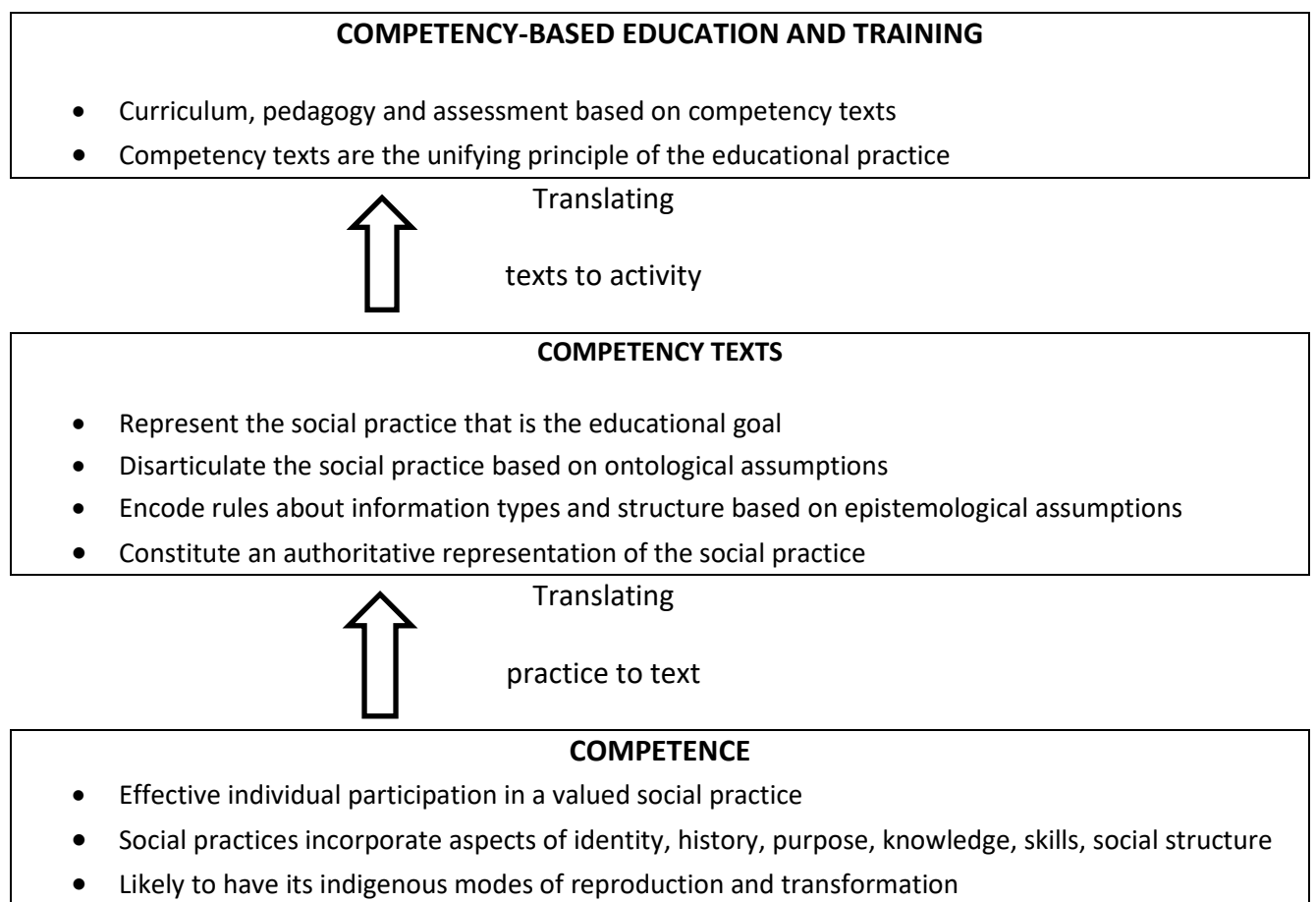


Fig. 1 Model of the competency approach. (Hodge et al., 2020, p. 36)

The above figure is read from the bottom box up. To summarise, the first step allows one to determine what competence should look like in each specific context. This ‘competence’ is then translated, through the ‘first hermeneutic dimension’, into textual form (Hodge et al., 2020). The middle box represents the key epistemological considerations in representing competency texts, and subsequently how competency documents are meant to be used (Hodge et al., 2020). The next step involves the ‘second dimension of hermeneutics’, which involves the process of translating texts into practice (Hodge et al., 2020). Finally, the top box represents how one would propagate curriculum and education-and-training activities (Hodge et al., 2020). Here it is essential that adequate guidance be given on implementation of curriculum, pedagogy, and assessment (Hodge et al., 2020).

CASA structure of competency units

Returning back to aviation, many Australian flight schools are registered training organisations that deliver vocational qualifications in the form of ground and flight training. These organisations are required to employ educators with relevant capabilities that can function effectively within the vocational sector that delivers training underpinned by a CBE/T framework (ASQA, 2019).

In Australian aviation, CBE/T describes observable performance, the level of performance, and the conditions under which the performance should take place. Contained within Part 61 are specific competency statements relating to pilot qualifications. The structure of competency units used by CASA are designed around unit of competency, elements, and performance criteria. Firstly, the definition of a unit of competency relates to, "...a discrete job or function that is written as a measure of outcome." (CASA, 2009, p. 9). For example, a unit of competency is 'land aeroplane'. Secondly, each unit is broken up into elements which, "...detail the various functions that must be carried out to satisfy the Unit Description." (CASA, 2009, p. 9). For example, if 'land aeroplane' is the unit, then elements of this unit would be 'land aeroplane in a crosswind' or 'recover from a mishandled landing'. Thirdly, each element has several performance criteria which are, "...evaluative statements that specify what is to be assessed and the required level of performance" (CASA, 2009, p. 9). In other words, these are the observable behaviours or actions in textual format. Fourthly, underpinning knowledge is, "...specific knowledge applicable to the unit of competency..." (CASA, 2009, p. 11). Lastly, to validate assessment, each unit will also have its own range statements, known as 'range of variables' under CASA's framework. These range statements detail the, "...conditions and contexts that should be applied during assessment." (CASA, 2009, p. 10). In summary, a student must demonstrate each performance criteria statement for them to be deemed competent in the associated element. Subsequently, the learner must

achieve competence in all elements to be considered competent in the associated unit.

Unfortunately, there is little guidance for flight instructors, through current CASA documentation, on how to relate and combine competencies. Particularly, for the purpose of developing a capability that is required in managing more complex tasks that rely on multiple skills or competencies that are related. In addition, very little guidance is given to training providers on implementation and curriculum design.

The research focus

The literature around CBE/T outside aviation appears to provide guidance on how to improve its utility on one side (Hagar, 2017; Hodge et al., 2020; Mulder, 2012; 2012; Wesselink et al., 2017), to a total discrediting of its application on the other (Ashworth & Saxton, 1990; Smith, 2010; Wheelahan 2009; 2016; 2019). Within aviation, there is evidence of research questioning CBE/T (Franks et al., 2014; Kearns et al., 2016). Surprisingly there is little research from CASA, conducted or supported, into the effectiveness of CBE/T for pilot training. Originally, the research team set out to investigate what perspectives flight instructors had in relation to CBE/T. Later the research findings highlighted, what appears to be a gap, in the aviation industry's understanding of the utility of CBE/T. It is true there may be several consideration and dimensions relating to educational practice. Nevertheless, the scope of this research offers a perspective from a specific ontological viewpoint which should be considered as part of the puzzle.

Methodology

Interpretive paradigm

An interpretive paradigm was chosen due to its emphasis on social interactions that influence meanings and actions (O'Donoghue, 2018). Furthermore, individual perspectives,

experiences, and actions also impact the collective meanings, assumptions, perspectives, interpretations, and actions. With this paradigm, the perspectives, meanings, interpretations, assumptions, and judgements are analysed through the descriptive words participants use. Narrowing the focus, the project's view was underpinned by symbolic interactionism. The theoretical concept of 'self' was adopted to further understand perspectives. This concept suggests a social cause-and-effect, upon the development of individuals, through interactions with others (O'Donoghue, 2018). This can be used to examine how meanings are formed which in turn influence actions in certain contexts. For data gathering and analysis, the research relied on qualitative enquiry and grounded theory (Charmaz, 2001; Charmaz & Belgrave, 2014).

The project involved three phases. Phase one focused on rapport building and arranging interviews. During phase two semi-structured and open-ended interviews were completed within the participants natural work settings (Charmaz, 2001; Charmaz, & Belgrave, 2014). The interview questions focused on topics such as participant qualifications, experience, activities around the interpretations of competency texts, implementation, and understanding of competency unit structure. Interviews were recorded and transcribed verbatim using Microsoft Software and manual correction by the lead researcher. These recordings were also listened to each time the transcriptions were viewed during data analysis and report drafting.

In phase three, data was loaded into a NVivo project. Here open-and-focused coding was used to create categories from which the data could be analysed (Charmaz, 2001; Charmaz, & Belgrave, 2014). Common themes emerged from these codes and categories, during the cross-case analysis, which assisted the researcher to determine participant perspectives. In addition, member checking was used prior to the cross-case analysis. Here participants were given summaries of their transcriptions so they could add new information

and validate conclusions. After the cross-case analysis the researcher returned to the relevant literature, notes, and memos (Charmaz, 2001; Charmaz, & Belgrave, 2014). This was to facilitate credibility, transferability, and to form a contextual-and-theoretical understanding regarding participant perspectives on CBE/T.

Data was constantly compared with the new data that came to light during each subsequent interview (Charmaz, 2001; Charmaz, & Belgrave, 2014). This refined the questions, highlighted additional avenues of questioning, and directed the project's sampling throughout the interview phase.

Participants

Sampling was both criterion and theoretical based (Cohen et al., 2017). Criterion sampling allowed the research to target specific groups for the interviews. Specifically, the research initially required data from three different organisations and nine individuals with different levels of experience and backgrounds. Particularly, it was planned to sample Grade 3 instructors (up to 1 year experience), Grade 2 instructors (over 1 year experience) and Grade 1 instructors (over 2-3 years' experience). On the other hand, theoretical sampling highlighted the tenth participant, from emerging data, towards the end of the interview phase.

Given the scope of the project, and time restraints, the sample size was limited to ten participants. It is true that this represents a small percentage of the total instructor population in Australia. Nevertheless, the project required a sample size large enough that represented the larger population yet small enough to manage the large amounts of qualitative data (O'Leary, 2021). To further improve the validity of the findings, that represented the larger population, the participants were determined through criterion and theoretical sampling as explained above (Cohen et al., 2017).

Ethics

The study’s ethical considerations were reviewed and approved in accordance with the Griffith University Human Research Ethics Committee guidelines. GU Ref No: 2021/030. Informed consent was obtained from all participants through consent forms.

Findings

Instructors

Total experience instructing was mean 4.7 years (SD =18.96). The participant pool was two Grade 3, four Grade 2, and four Grade 1; referred to as P1 to P10. They are also named in order of instructor-grade qualification, for example the Grade 3 instructors are P1 and P2. Table 1 shows the participants’ instructional qualifications, industry experience, and instructor experience.

Instructor Grade is determined by meeting specific regulatory requirements (Australian Government, 2021). Generally, to obtain a Grade 3 qualification pilots would need a Commercial Licence and would have undergone an approved instructor training course. In turn, before obtaining a Grade 2 qualification, a Grade 3 instructor would need at least 200 flight instructional hours conducted during initial flight training. Once a Grade 2 instructor wishes to progress to Grade 1, they must have at least 500 flight instructional hours conducted during initial flight training. Prior to gaining a higher qualification (e.g., Grade 3 to Grade 2) instructors must pass a flight assessment.

Table 1

Participant qualifications and experience

Participant	Qualifications		Experience	
	CASA Teaching Approval	Cert. IV (Training & Assessment)	Industry	Instructional

P1	Grade 3.	No.	None.	Approx. 1 year.
P2	Grade 3.	Yes.	None.	None, 2-4 years ground school educator.
P3	Grade 2.	No.	None.	Over 2 years.
P4	Grade 2.	Yes.	Yes.	Over 2 years.
P5	Grade 2.	Yes.	None.	Over 2 years.
P6	Grade 2.	No.	None.	Over 2 years.
P7	Grade 1.	Yes.	Yes.	Over 2 years.
P8	Grade 1.	Yes.	Yes.	Approx. 20 years.
P9	Grade 1.	Yes.	None.	Approx. 12 years.
P10	Grade 1.	No.	Yes.	Approx. 4 years.

Note. The participants who did not hold a Cert. IV have all completed the unit competencies for this qualification at some point in their career.

Instructor interpretive capability

During interviews, participants were asked to read and interpret parts of authoritative competency texts. Focus was placed on activities relevant to the participants' daily duties. Specifically, the readings focused on the competency unit, "Manage abnormal situations – single engine aeroplanes" (Australian Government, 2014). This unit was selected by the research team due the commonality and complexity it offers regarding interpretation and implementation.

It became apparent that interpretations were not based on sound interpretive processes but were influenced by factors such as selective-and-biased readings. In fact, inadequate interpretive capability was evident even for the most experienced participant. In this context, selective reading can be understood as when a person's interpretation focuses on parts of the text that they deem important. On the other hand, bias occurs when the texts are interpreted

from a predetermined point of view or idea, based on personal assumptions, which may cause interference with the accuracy of the reader's conclusions (Hodge et al., 2020; Owen, 1982). The data revealed that participants' selective-and-biased readings were influenced by factors such as availability and type of workplace resources, amount of workplace professional development, and previous industry-or-operational experiences.

There were several examples of selective reading found from P1, P2, P4, P6 and P7. For instance, P1 read through, verbatim, the performance criteria of the simulated emergency landings but then interpreted only parts of the text. This resulted in a limited or incomplete interpretation of the texts. For instance, item (iii) of the performance criteria for emergency landings states, "formulate and describe a recovery plan, including selecting the most suitable landing area" (Australian Government, 2014). The participant's interpretation focused on 'formulating' and 'field selection'. Here, the participant seems to be fixated on observing the student's actions and outcomes rather than exploring the learner's internal processes as suggested by the text requirements. In other words, the interpretation omitted the requirement for the student to 'describe' their actions and plan.

... what I'm looking for here is... are they [the student] taking into consideration... [field dimensions]... [and] general conditions so they got a good idea of... visual cues of where the wind might be coming from... and are they able to implement what they're... observing... in coming up with a good... recovery plan of where to put the aeroplane. (P1)

Similarly, there were examples of biased reading for P3, P4 and P10 due to operational experiences such as actual emergencies and/or glider training. For example, P10's interpretations of the texts had a heavy emphasis on aircraft control when he said,

So initial actions... here we teach... just control the aircraft, trim it up nicely, and then troubleshoot... the most important thing, probably more important than

the checks, is that they fly the aircraft, and they've identified... somewhere to land. (P10)

Later, this emphasis on control was also evident when P10 mentioned that some training aspects, which are meant to be conducted during airborne instruction, are only focused during ground briefings.

...it's something, probably I will more cover on the ground than in the air with that competency. I'll touch on it, but I'm more focused on the actual practical side [aircraft control and field judgment] ... (P10)

In addition, the interview with P10 highlighted that certain training aspects tended to be omitted from the airborne sequence entirely.

The passenger... [brief]... about the flight situation, brace position and harness security. Again, that's definitely something that was more target on the ground brief than the actual lesson... shouldn't be teaching that in the air anyway, really. (P10)

Another example of incomplete reading and likely omission of textual requirements is when P5 emphasised a focus on control of the airplane, completion of the required checks and field selection. However, the interpretation omitted a subtle, yet vital, requirement that one should firstly identify that the engine failure had occurred.

...first of all... make sure you control the [aircraft]... from what I read there... then go through... the [checks]... then from there look for a suitable landing area. (P5)

On the other hand, P6 omitted the requirement for initial control of the airplane even though the text clearly indicated an emphasis on control. Rather, P6 placed emphasis on identification of the engine failure and said, "...so in that one... has the student been able to identify the... [engine] failure".

The question is, would factors such as selective-and-biased interpretations lead to certain requirements being neglected or omitted from training activities? In fact, P1, P3, P4, P5, P7 and P10 all admitted to both minor and significant omissions occurring during training activities and P4 even reported on safety incidents involving students that were considered competent. Consequently, one must consider the impact of incomplete interpretations on an instructor's ability to align occupational practice with the textual requirements to achieve the required training outcomes. Therefore, interpretation may link directly to implementation and practice.

Implementation of competency requirements

One reason that participants struggled with interpretations was due to a lack of effective-and-regular engagement with texts. This was primarily due to an over-reliance on company resources and confidence in their own capability which directed practice. In fact, P1, P3, P5, P6 and P9 admitted that they did not engage with the authoritative texts or performance criteria for lesson development. In addition, nearly all participants mentioned that they did not engage with competency texts, post-flight, to confirm that lesson objectives had been achieved. This was even true for the participants who relied on computer-based software that facilitated pre-lesson planning and post-flight confirmation of requirements. For example, P3 explained his level of engagement with competency texts when using company documents. He said,

All those things [company resources] you read through it, and then I'll just sort of sit down and then pick out the key points that need to be taught. (P3)

For this participant, and six others, company documents only captured the units and elements. Even then, engagement with the units and elements were minimal. Participant 3 said,

...you're probably not going to go through every single individual item, but you can get a... clear understanding of what needs to be taught. (P3)

Participant 8 mentioned that, generally, there is very little meaningful engagement with competency text for most instructors and an overreliance on company resources.

... I don't think there's enough emphasis on [instructors] going back to the source documentation. They tend to rely on the company [guidance material]... Which should theoretically meet the competency requirements but sometimes there are gaps or differences. (P8)

Moreover, the level of engagement with performance criteria was minimal even for those participants who relied on a computer-based system. This system included the performance criteria and would theoretically encourage a higher level of engagement with texts. In this context, the lack of engagement was due to participant confidence in their experience and capability. Both P4 and P7 relied on computer software to assist lesson development and post-flight confirmation of objectives. However, both indicated that they did not actively engage with performance criteria due to their confidence in knowing what to do. For example, P7 said, "...after like... 50 hours... you just know what you're doing". Participant 9 also shared this sentiment and confidence in his own experience and company resources. To develop his daily lesson plans P9 said he would rely on, "... reference material from... the company itself... otherwise, to be quite honest, it's experience".

There was evidence that P1, P2, P3, P5, P6 and P10 would determine competence through overall student performance instead of verifying that all the performance criteria had been met. Also, in certain cases there were tasks that were deemed more important than others, such as flying skills and decision making. However, non-flying skills, such as checks and radio calls were deemed less important. In fact, it was permissible if the student demonstrated an inadequate standard for these tasks in some contexts. For instance, P1 and P10 completely omitted these 'unimportant tasks' during teaching and assessment due to operational

circumstances. On the other hand, if the 'important items' were adequately demonstrated by the student, then they would still consider that student competent. For example, P10 said,

... I probably wouldn't say for the assessment perspective I'm as concerned with the passenger management and... the mayday calls and things like that. (P10)

After lessons, participants used their own personal judgment and experience to determine if objectives had been met. Participant 10 also explained that at the end of the lesson, when signing competencies, verification would become,

... more of a... just a tick exercise at the end of the day... yeah, I did that, we did that... oh, we didn't do that... let's do that next lesson sort of thing. (P10)

The data also highlighted the influence of company resources-and-practices on instructor interpretation-and-implementation. Specifically, it seemed that the company orientates practices towards assessment and the end outcome rather than training activities. In other words, instructors form their lesson plan without much consideration of the in-between steps that are required to be taken towards the end goal. This could also explain why participants reported unintentional omissions of certain requirements, and only realising this after the lesson has been completed. Participant 10's words demonstrated a focus on the end outcome when he said,

On a very... practical level... in the event of a... engine failure, would he survive? Yes or no? Yes: competent... no: ok, let's practice some more... I'm holy about the end outcome. (P10)

Participant 6 shares a very similar sentiment when relating a competent performance of landing an aeroplane to, achieving overall, a safe outcome. He said,

... if you [are] generally feeling unsafe or anything like [that]... then it's probably not... to standard. (P6)

In addition, P7 also demonstrated an orientation towards the end outcome and a lack of regular-and-meaningful consideration of the competency text requirements. He uses short field operations as an example and his words reflect consideration of the units and elements but not the performance criteria. He said,

The only two competencies that are required to be assessed is takeoff... under short field configuration, and obviously landing under short field configuration. So, what you want to do is, you want to try and, it's been a while since I've actually thought about it, because... after like... 50 hours... you just know what you're doing. (P7)

The impact of instructional capability to interpret and implement competency requirements are paramount. In fact, P1, P3, P4, P5, P6, P9 and P10 all raised concerns relating to students who were deemed competent in certain tasks. These specific students later performed below standard, and some were also involved in safety incidents. The participants gave various reasons for this. However, P4 gave insight into the challenging environment that instructors are operating in. In addition, considering the factors listed so far would also exacerbate educator capability within this training environment. Participant 4 said,

... you can't train for literally every scenario, within a 36-hour [syllabus]... I am aware of the limitations of... memory, particularly when... it's not exercised frequently.

Participant 6 also explained that in this challenging training environment student do not always retain competency. He said,

... flying is [an] incredibly [practiced] based activity, so if they're not current then you can expect there will be some degradation in terms of their competency. (P6)

Syllabus hours vary for each organisation, but these participants alluded that tasks are only practiced a limited number of times, within a limited number of contexts. This raises a concern for educational standards and learning outcomes within the aviation environment where educators are often left to their own devices.

The data also indicated that workplace professional development in interpreting and implementing competency requirements seem insufficient. In fact, all participants indicated that ongoing development in relation to CBE/T was non-existent. This was primarily due to an organisational over-confidence that resources, qualification upgrades, and periodic reviews were enough to support educator development and capability. Furthermore, when problems arose within the workplace participants indicated that these were addressed reactively instead of through active workplace initiatives. This lack of development highlighted a concern in relation to educational capability and could be a reason why participants demonstrated an incomplete understanding of competency unit structure.

Competency unit structure and learning outcomes

The participants were all asked questions relating to competency unit structure. Specifically, units, elements, performance criteria, range statements (range of variables), and underpinning knowledge. Participants struggled to explain these terms from an academical aspect which could show a lack of conceptual understanding. For example, P3 said, “It’s very confusing... looking at these things and putting names to it”. Participant 7 also said, “... I’m actually not too familiar with this...”, and P5 said, “... good question...”, when asked to define specific parts of the unit structure. Through observing responses, it was clear that at least six participants were unfamiliar with these terms. In fact, P1, P3, P5, P6, P7 and P9 were only able to offer partial explanations after they viewed the examples given to them during the interview. Regardless of their unfamiliarity, participants were able to point to the performance criteria as the important texts that they needed to refer to for training-and-assessment.

The data highlighted range of variables as an area of concern for P1, P3, P5, P6, P7 and P9. For example, one of the more senior participants (P9) referred to range of variables as an, “... acceptable variation”. Particularly, he related this to individual or personal preferences. He said,

... the way [instructors] come up with things is in a slightly different way, but they still come up with the same result. (P9)

Participant 1 said, “... I haven’t really thought about range of variables apart from weather”, and P3 admitted, “... I couldn't put words to range of variables”.

Similarly, P1, P3, P4, P6 and P10 viewed underpinning knowledge as the pre-lesson knowledge required by students. For example, P4 said,

... That's the expectation that... there will have been prior work. Before the student comes to the lesson, that they will have had some element of either ground school... they have done their own study, so before even stepping out into the aircraft, there's board work to do 10 or 15 minutes of asking question... there's a certain amount of knowledge... you should have before we go flying.

Similarly, P10 said, “...there should also be a minimum required knowledge before that lesson starts”, and P6 felt that underpinning knowledge was, “...that knowledge that's necessary prior to actually going out and doing a... lesson”. However, these participants’ views of underpinning knowledge do not conform to the full scope of CASA definition (CASA, 2009, p. 11). In addition, certain topics found under the underpinning knowledge sections do not necessarily cover the pre-lesson content these participants are referring to. Furthermore, pre-lesson content is also subject to the educator’s judgment in determining what that content should be. Ultimately, underpinning knowledge is not always covered to the full scope of CASA’s intention.

Discussion

Previous studies have called into question the utility of CBE/T. Even though there had been some support of CBE/T, with possible improvement strategies (Hagar, 2017; Mulder, 2012; 2012; Wesselink et al., 2017), there is a large body of literature critical of CBE/T (Ashworth & Saxton, 1990; Smith, 2010; Wheelahan 2009; 2016; 2019). Even though aviation had limited studies conducted into CBE/T, almost all questioned its use (Franks et al., 2014; Kearns et al., 2016). The aim of this paper was to add to this small body of literature into aviation training, particularly with a focus on the airborne instruction of new pilots. The findings suggest there are three areas that need to be addressed namely, instructor interpretive capability, implementation of competency requirements, and competency unit components.

Instructor interpretive capability

The findings revealed several areas of interest relating to instructor interpretive capability. Both vocational sector and CBE/T frameworks make assumptions that educational-and-assessment activities are conducted by competent practitioners (Hagar, 2017). This includes the ability to interpret and implement competency text requirements (Hodge, 2017). For instance, the Australian Skill Quality Authority's expectation regarding educator skills and knowledge are laid out in their guidance material under clause 1.13 (ASQA, 2019). Consequently, there may exist doubt to the capability of some instructors. This doubt is created partly due to the lack of industry and educational experience for most instructors. In addition, there was also a lack of meaningful engagement with competency texts before and after flight lessons. Poor interaction with authoritative texts is problematic because it disconnects educators from meaningful engagement-and-conceptualisation of competency requirements which undermines the process of adequate interpretation and implementation as suggested by the literature (Hodge et al., 2020; Kearns et al., 2016). In other words,

instructors may struggle to convert text requirements into meaningful training activities due to unsound interpretation processes. In this context instructors may be challenged to rely on their own occupational knowledge and experience, which according to the data is limited in most cases. An adequate interpretative process is also a clear recommendation highlighted in the ‘competence approach’ by Hodge et al., (2020). In the absence of sound interpretative processes, students may also not be exposed to clarity relating to the expectations or requirements (Kearns et al., 2016). Also, instructors may be less likely to effectively combine related competencies during implementation (Kearns et al., 2016). In the current context one might ask, in the absence of meaningful engagement with texts, are instructors providing adequate learning experiences to their students and are the competency requirements being met? This is an important question especially when the data indicated the possibility for omissions and incomplete interpretations. Consequently, incomplete-or-incorrect interpretations may lead to undesired learning outcomes, or worse, an illusion that the requirements have been met.

The participants highlighted that Part 61 was a difficult document to use and interpret. This may have encouraged the over-reliance on company documents and resources that directed training-and-assessment activities. This does bring into question the regulator’s guidance in relation to their understanding of CBE/T versus a sound ‘competent approach’ (Hodge et al., 2020). Specifically, how guiding documents are designed, guidance on how to use CASA documents, and guidance to organisations and educators to create and use their own effective resources. Unfortunately, in the context of CBE/T, current literature and guidance within the aviation industry is limited and out-of-date which could be impacting the industry’s understanding and capabilities.

Implementation of competency requirements

Implementation is linked to interpretation and forming a clear understanding of what the competency requirements are. All the participants relied on company interpretation and guidance that directed practice. Seven instructors relied on company documents that did not contain the performance criteria from competency texts. The other three participants relied on a computer-based system that contained all the essential competency unit structural components, including the performance criteria. However, nearly all the participants did not engage with these competency texts, even when readily available, that would have shaped their activities. On one hand this was due to the over reliance on company resources, but on the other hand it was also due to self-confidence that developed through occupational experience. Even though participants clearly understood that competency text are authoritative, they placed more authority on their own ability. Specifically, the participants felt they understood the requirements without referring to any competency texts. In addition, P1, P9, P5, P6, P8 and P10 also felt no need to affirm, through peer review, their interpretations or implementation practices. This supports the literature which also indicated that many educators would rely on their own capabilities without feeling the need to seek validation on their own views from peers (Kearns et al., 2016). Interestingly but not surprisingly, the literature highlighted the need for educators to rely on their own expertise and capabilities to inform practice (Hodge et al., 2020). In a way this research's findings seems to conflict with this notion. Particularly, that participant experience and expertise seemingly had a negative impact on both interpretation and implementation. However, this may likely be true, in this context, due to a lack of professional development and occupational experience. Particularly, development is required in interpretive ability and pedagogy that targets sound implementation in relation to CBE/T and the 'competence approach' (Hodge et al., 2020).

Company resources and participants were also orientated towards the end outcome. This may likely be due to the impact of CASA's resources that are oriented towards assessment rather than training. This orientation led to the omission of certain text requirements that were deemed less important. This again relates to document and resource design (Hodge et al., 2020). This article further highlights the need for industry documents and systems to be designed in such a way that orientates practices towards training just as much as assessment.

The industry assumptions about flight instructor capability were not supported. All participants held relevant qualifications; however, the findings highlighted several considerations and implications. The data revealed that qualifications, experience, or periodic reviews were not adequate in developing sound implementation of CBE/T. This notion is supported by the literature recommendations for professional development, in relation to CBE/T (Billett & Choy, 2013; Franks et al., 2014; Hagar, 2017). More importantly, organisations must orientate development in such a way that capabilities are moved beyond 'passive compliance', which CBE/T tends to cause (Day, 2017). In turn, this may cultivate instructor understanding on how to implement CBE/T without having to primarily rely on organisational documents or systems. In fact, company resources should support the educator's own knowledge and understanding but instructors must not become solely reliant on these, which seems to be the current context. Targeted development may also instil a culture of critical thinkers with an improved understanding of CBE/T and can bring about continued development within the industry. However, this may be challenging in a climate where many instructors become educators without much experience or adequate academical training.

Another challenge highlighted by participants was the limiting syllabus hours and course timeframes. Particularly, many participants reported that students often would perform below standard even after being assessed as competent. It is true that syllabus restrictions may

play a part in this specific issue which is a consideration for a future discussion. However, one must again question instructor capability here given that most do not hold enough experience when they start their career. In fact, much of an instructor's development occurs through trial and error. Some development may occur through qualification upgrades or periodic reviews, but these do not encourage development in an academic sense. More importantly, this demonstrates a requirement for the industry to develop adequate documentation and professional development programs which will guide instructional activities. In addition, this also highlights the necessity for the aviation industry to develop a more complete understanding in line with a sound 'competence approach' (Hodge et al., 2020). Unfortunately, the failures to effectively utilise CBE/T within the industry is even more apparent through the lack of understanding relating to competency unit structure.

Competency unit components and learning outcomes

The next consideration is the impact of poor understanding of CBE/T structural components. It was evident both through observation and responses that many of the participants were unclear on the theoretical concepts of competency unit structure, or components, and how these components relate or function together. All participants, except P10, were able to recall the purpose of the performance criteria, and that these texts provided guidance for training-and-assessment. However, a lack in theoretical understanding impacted an appreciation, and the importance, of carefully reading texts. In turn, this influenced interpretation and led to subtle and significant errors during participant responses. In addition, there is a potential that subtle or significant omissions could occur that would have lasting consequences on learning outcomes. The literature emphasised that educators should know how competency texts relate to one another to ensure effective implementation (Kearns et al., 2016). The 'competent approach' highlighted the importance of sound document-and-text design and educator ability

to interpret and implement text requirements (Hodge et al., 2020). This article supports the above literature and also adds that effectiveness also relies on a sound theoretical understanding and appreciation of competency unit structural components. Consequently, by knowing how the different components function together may guide a more holistic reading and consideration of text requirements which may lead to improved training-and-assessment processes.

One of the areas of interest related to range of variables. These range statements are the explicit criteria under which assessment must take place. However, at least six participants were unclear of the purpose of this component, and they were only able to offer partly correct responses after viewing the range statement examples provided to them. The main reason, for this lack in familiarity, is that most of the circumstances dictated by the range statement occur naturally during flights without requiring much thought or facilitation from an instructor. Nevertheless, there are contexts during flight training where careful facilitation would be required to ensure the applicable assessment criteria are met. In addition, purposeful facilitation also leads to authentic and contextual workplace scenarios during assessments. Without a clear understanding here may result in assessments that are not valid, not authentic, and not contextual. This also could lead to compromised learning outcomes and relates to effective implementation highlighted by the literature (Kearns et al., 2016).

Another area of concern related to underpinning knowledge. Unfortunately, there is confusion between the various CASA documents on the definition and application of this term. In addition, there are also misalignments of other knowledge areas within CASA documentation. Both these issues relate to a larger discussion for another time. However, this article does wish to highlight the divergence within the industry to provide sound documentation and references (Hodge et al., 2020). Nevertheless, underpinning knowledge focuses on the practical knowledge related to each unit of competency. Here P1, P3, P4, P6

and P10 linked underpinning knowledge to pre-lesson preparation. It is true, certain pre-lesson preparation would capture parts of the underpinning knowledge. However, pre-lesson knowledge does not always capture all the areas or topics listed under some units' underpinning knowledge. Furthermore, the participants did not indicate that they would consult the topic lists for this knowledge area. All of this would have implications for the integration of specific practical knowledge during training. Importantly, the literature highlights the negative impact of CBE/T on critical aspects of knowledge which influences learner capabilities (Wheelahan 2009; 2016; 2019). This article echoes this sentiment and highlights that an additional disconnect of theoretical-and-practical knowledge may exist within flight training which could exacerbate the negative impact of CBE/T on learning outcomes.

Conclusion

The aim of this study was to investigate flight instructor perspectives on CBE/T. Research data indicated that many instructors, irrespective of experience, may have difficulty interpreting and implementing competency text requirements. There were several reasons such as poor engagement with authoritative texts. In addition, instructor capabilities might be negatively influenced by an incomplete understanding of competency unit structure. Furthermore, it was evident that industry documentation and practices diverged from a sound 'competence approach' (Hodge et al., 2020). There is a movement in the industry for companies to adopt technological systems that support instructors. However, interpretation-and-implementation issues were evident for participants that used such computer-based systems, which may cast doubt on the industry's training-and-assessment practices.

The pressures faced by instructors to operate within strict deadlines and hour requirements are clear. The impact of these pressures on outcomes may be worth considering in future research. However, the authors of this article wish to leave the reader with the following considerations. The research sampled data from three separate flight schools and ten participants with various degrees of experience and qualifications. The data revealed concerns for nearly all the participants. These concerns related to incorrect interpretation and implementation of competency requirements. One must consider the potential risks and ask: even though the sample size was small, is it representative of the larger industry and instructor population? Three well known and respected organisations participated. In addition, both inexperienced and experienced instructors participated. Therefore, it is probable that the findings could be representative of a large proportion of the industry's instructor population. If this is the case one must consider how many instructors and organisations have an incomplete understanding of CBE/T. This may also lead one to ask if the industry is indeed training new pilots that are competent? If the answer to the previous question is no, then one must consider if the industry is really doing all it can to achieve its goals for improved training and safety. One must also consider, if the issues highlighted in this article, are due the limitations of CBE/T or due to a failure to implement and develop a sound 'competence approach' (Hodge et al., 2020). Therefore, one could conclude and ask: given aviation's context, is CBE/T really the best approach for the industry? Based on the data of this research there is much doubt on the industry's current understanding and utility of CBE/T. Most significantly, there is doubt that the industry will truly achieve higher standards or improved learning outcomes. Ultimately, the main goal for CASA, through the introduction of CBE/T, was to improve safety outcomes. This, however, may be overly ambitious in the current context under a CBE/T framework.

References

Ashworth, P. D., & Saxton, J. (1990). On 'competence'. *Journal of Further and Higher Education*, 14(2), 3-25. Retrieved from

<https://www.tandfonline.com/doi/abs/10.1080/0309877900140201>

ASQA. (2019). *Clauses 1.13 to 1.16—Employ skilled trainers and assessors*.

Retrieved August 20, 2021, from <https://www.asqa.gov.au/standards/training-assessment/clauses-1.13-to-1.16>

Australian Government. (1998). *CASR 1998*.

<https://www.legislation.gov.au/Details/F2021C00238>

Australian Government. (2014). *Part 61 manual of standards instrument 2014*.

<https://www.legislation.gov.au/Details/F2021C00449>

Australian Government. (2021). *Civil aviation safety regulations 1998 (Subpart 61.T)*. CASA.

https://www.legislation.gov.au/Details/F2021C01233/Html/Volume_2#_Toc89843956

Billett, S. (2017). Developing domains of occupational competence: Workplaces and learner agency. In M. Mulder (Ed.), *Competence-based vocational and professional education: Bridging the worlds of work and education* (pp. 47-66). Springer.

<https://link.springer.com/book/10.1007%2F978-3-319-41713-4>

Billett, S., & Choy, S. (2013). Learning through work: Emerging perspectives and new challenges. *Journal of Workplace Learning*, 25(4), 264-276.

<https://doi.org/10.1108/13665621311316447>

CASA. (2009). *Competency based training and assessment in the aviation environment*

(CAAP 5.59A-1(0)). Australian Government. <https://www.casa.gov.au/files/559a1pdf>

CASA. (1999). *Day (VFR) syllabus - aeroplanes* (CASADOC201). Civil Aviation Safety Authority.

CASA. (2021). *Flight examiner handbook* (D20/17477). Australian Government.

<https://www.casa.gov.au/publication/flight-examiner-handbookexaminer-handbook>

Charmaz, K. (2001). Qualitative interviewing and grounded theory analysis. In J. Gubrium & P. J. Holstein (Eds.), *Handbook of interview research: Context and method*. SAGE.

https://methods-sagepub-com.libraryproxy.griffith.edu.au/book/handbook-of-interview-research?utm_source=ss360&utm_medium=discovery-provider

Charmaz, K., & Belgrave, L. L. (2014). Qualitative interviewing and grounded theory analysis. In J. F. Gubrium, J. A. Holstein, A. B. Marvasti, & K. D. McKinney (Eds.), *The SAGE handbook of interview research: The complexity of the craft* (2nd ed., pp. 347-366).

SAGE Publications. <https://methods-sagepub-com.libraryproxy.griffith.edu.au/Book/handbook-of-interview-research-2e>

Cohen, L., Manion, L., & Morrison, K. (2017). *Research methods in education* (8th ed.).

Taylor & Francis Group. <https://ebookcentral-proquest-com.libraryproxy.griffith.edu.au/lib/griffith/detail.action?docID=5103697>

Day, C. (2017). Competence-based education and teacher professional development. In M. Mulder (Ed.), *Competence-based vocational and professional education: Bridging the worlds of work and education* (pp. 165-182). Springer.

<https://link.springer.com/book/10.1007%2F978-3-319-41713-4>

Franks, P., Hay, S., & Mavin, T. (2014). Can competency-based training fly?: An overview of key issues for AB initio pilot training. *International Journal of Training Research*, 12(2),

132-147. <https://doi.org/10.1080/14480220.2014.11082036>

Hagar, P. (2017). The integrated view on competence. In M. Mulder (Ed.), *Competence-based vocational and professional education: Bridging the worlds of work and education* (pp. 203-228). Springer. <https://link.springer.com/book/10.1007%2F978-3-319-41713-4>

Hodge, S. (2017). Standardised curriculum and hermeneutics: The case of Australian vocational educators. *Journal of Curriculum Studies*, 50(1), 38-55.

<https://doi.org/10.1080/00220272.2016.1278042>

Hodge, S., Mavin, T., & Kearns, S. (2020). Hermeneutic dimensions of competency-based education and training. *Vocations and Learning*, 13(1), 27-46.

<https://doi.org/10.1007/s12186-019-09227-y>

ICAO. (n.d.). *About ICAO*. International Civil Aviation Organization.

<https://www.icao.int/about-icao/Pages/default.aspx>

Kearns, S. K., Mavin, T. J., & Hodge, S. (2016). *Competency-based education in aviation: Exploring alternate training pathways*. Taylor & Francis Group. <https://ebookcentral-proquest-com.libraryproxy.griffith.edu.au/lib/griffith/detail.action?docID=4338107>

<https://ebookcentral-proquest-com.libraryproxy.griffith.edu.au/lib/griffith/detail.action?docID=4338107>

Lassnigg, L. (2017). Competence-based education and educational effectiveness. In M. Mulder (Ed.), *Competence-based vocational and professional education: Bridging the worlds of work and education* (pp. 667-693). Springer.

<https://link.springer.com/book/10.1007%2F978-3-319-41713-4>

Lowrie, T., Smith, E., & Hill, D. (1999). *Competency-based training: A staff development perspective*. https://www.ncver.edu.au/__data/assets/file/0014/4316/388.pdf.

https://www.ncver.edu.au/__data/assets/file/0014/4316/388.pdf

Mulder, M. (2012). Competence-based education and training—About frequently asked questions. *The Journal of Agricultural Education and Extension*, 18(4), 319-327.

<https://doi.org/10.1080/1389224x.2012.692527>

Mulder, M. (2012). Competence-based education and training. *The Journal of Agricultural Education and Extension*, 18(3), 305-314.

Mulder, M., & Winterton, J. (2017). Introduction. In M. Mulder (Ed.), *Competence-based vocational and professional education: Bridging the worlds of work and education* (pp. 1-43).

Springer. <https://link.springer.com/book/10.1007%2F978-3-319-41713-4>

O'Donoghue, T. (2018). *Planning your qualitative research thesis and project: An introduction to Interpretivist research in education and the social sciences* (2nd ed.). Taylor & Francis Group.

<https://ebookcentral-proquest-com.libraryproxy.griffith.edu.au/lib/griffith/detail.action?docID=5517561>

O'Leary, Z. (2021). *The essential guide to doing your research project* (4th ed.). Sage Publications.

<https://books.google.com.au/books?hl=en&lr=&id=498eEAAAQBAJ&oi=fnd&pg=PP1&dq=The+essential+guide+to+doing+your+research+project+&ots=rS6HYtQjzS&sig=naVDYR5aM9VZanymmXJiQsYOGu4#v=onepage&q=The%20essential%20guide%20to%20doing%20your%20research%20project&f=false>

Owen, R. (1982). <https://jamanetwork.com/journals/jama/article-abstract/372539>. *JAMA*, 247(18), 2533-2534. <https://jamanetwork.com/journals/jama/article-abstract/372539>

Smith, E. (2010). A review of twenty years of competency-based training in the Australian vocational education and training system. *International Journal of Training and Development*, 14(1), 54-64. <https://doi.org/10.1111/j.1468-2419.2009.00340.x>

Vonken, M. (2017). Competence, qualification and action theory. In M. Mulder (Ed.), *Competence-based vocational and professional education: Bridging the worlds of work and education* (pp. 67-82). Springer. <https://link.springer.com/book/10.1007%2F978-3-319-41713-4>

Wesselink, R., Biemans, H., Gulikers, J., & Mulder, M. (2017). Models and principles for designing competence-based curricula, teaching, learning and assessment. In M. Mulder (Ed.), *Competence-based vocational and professional education: Bridging the worlds of work and education* (pp. 533-554). Wageningen, The Netherlands: Springer.

Wheelahan, L. (2009). The limits of competency-based training and the implications for work. In J. Field, J. Gallacher, & R. Ingram (Eds.), *Researching transitions in lifelong learning* (pp. 201-212). Routledge. [https://www.taylorfrancis-com.libraryproxy.griffith.edu.au/books/edit/10.4324/9780203875179/researching-transitions-lifelong-learning-john-field-jim-gallacher-robert-ingram](https://www.taylorfrancis.com/libraryproxy.griffith.edu.au/books/edit/10.4324/9780203875179/researching-transitions-lifelong-learning-john-field-jim-gallacher-robert-ingram)

Wheelahan, L. (2016). Patching bits won't fix vocational education in Australia – a new model is needed. *International Journal of Training Research*, 14(3), 180-196. <https://doi.org/10.1080/14480220.2016.1254368>

Wheelahan, L. (2019). Knowledge, competence, and vocational education. In D. Guile & L. Unwin (Eds.), *The Wiley handbook of vocational education and training* (1st ed., pp. 97-112). John Wiley & Sons. <https://ebookcentral-proquest-com.libraryproxy.griffith.edu.au/lib/griffith/detail.action?docID=5646099>

Wuttke, E., & Seirfried, J. (2017). Modeling and measurement of teacher competence: Old wine in new skins? In M. Mulder (Ed.), *Competence-based vocational and professional*

education: Bridging the worlds of work and education (pp. 883-901). Springer.

<https://link.springer.com/book/10.1007%2F978-3-319-41713-4>