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Knowledge typologies for professional learning: educators' (re)generation of knowledge when learning open educational practice

1.0 Introduction

Open education resources (OER), together with the technology and licensing that support their use, are changing the higher education landscape, enabling educators to reuse, repurpose and redistribute resources across the various contexts of their practice (Littlejohn & Pegler, 2014; Masterman & Wild, 2012). OER are teaching, learning, and research resources and materials that are openly and freely available for consultation and use, as well as for repurposing and remodelling by other users (Atkins, Seely Brown, & Hammond, 2007; UNESCO, 2002). While the concepts that underpin OER, sharing and reuse, are not new to education, issues exist around the notions of 'open' and 'educational' and the challenges they present to the traditional rules, cultures and codes of learning in higher education. It has been argued that open learning is not bounded by the rules governing conventional education (Bentley, 2012; Sharples, Taylor, & Vavoula, 2010). Learning can be geographically dispersed, unbounded from the traditional classroom setting (Sharples et al., 2010), with learners positioned as active agents who navigate learning opportunities dispersed across multiple spatial and conceptual settings (Littlejohn, Falconer, McGill, & Beetham, 2014). OER have frequently been conceptualised as objects that can support change agency due to their ability to open accessibility to learning opportunities as well as to enable the restructure the nature of teaching and learning within higher education. However, to date the impact of OER, particularly in traditional higher education institutions, has been limited (Ehlers, 2011; Kortemeyer, 2013; OPAL, 2011).

Change efforts have predominantly centred on educational content, for example OER, and open courseware (Ehlers, 2011; OPAL, 2011). However, for educators to take full advantage of the opportunities OER offer they must expand and adapt their professional practice, adopting what are commonly referred to as open education practices (OEP) (Littlejohn & Hood, 2017; Tynjälä, 2013). While the term OEP has been variously defined (for different definitions see Beetham, Falcolner, McGill, & Littlejohn, 2012; Conole & Ehlers, 2010; CTOED, 2008; Geser, 2010), there is growing consensus that it incorporates the production, management, use and reuse of resources as well as the construction of new pedagogies and learning activities. Therefore, to encourage educators' engagement with OER and OEP attention must be given to the institutional and educational frameworks and pedagogical models within which these resources and tools operate (Geser, 2007) as well as how to develop the necessary institutional conditions and capabilities to support OER use. This dual focus aligns with the professional learning literature, which suggests that change in practice requires the construction of conceptual and practical knowledge as well as the development of socio-cultural and self-regulative knowledge (Eraut, 2004; Tynjälä, 2008). The concurrent construction of multiple types of knowledge is most readily achieved through a combination of formal learning activities with informal, on the job learning where the workplace operates as a site where learning is both undertaken and applied (Harteis & Billett, 2008).

This paper forms part of a larger study investigating the types of knowledge educators need to develop as they learn from and with OER (Littlejohn & Hood, 2017; Hood, Littlejohn, & Milligan, 2015). The project emerged from the European Commission's

positioning of the production and adoption of OER as a strategic priority, key to addressing the current need to rethink and develop higher education and further education in a way that is compatible with societal development and the changing skills and knowledge required in the 21st century (Ecorys & Bertelsmann Stiftung, 2015). A key recommendation of the report is that the European Union ‘supports European network-building and communities of practice of adult learning providers and educators in sharing good practice on the use of ICTs and OERs in adult learning. (Ecorys & Bertelsmann Stiftung, 2015, p.102). Despite the increasing attention of the potential of OER and OEP, there is recognition that the reuse and repurposing of OER by adult educators remains under-developed (Ehlers, 2011; Kortemeyer, 2013; OPAL, 2011). The argument for Open Educational Resources and Open Education Practice extends beyond arguments for an ‘economy of scale’ in which OER routinely are created, exchanged and reused (Littlejohn, 2003). Networked and social technologies provide environments for the co-construction of knowledge that require the application of specific epistemic practices (Saljo, 2012; Ludvigson, 2012). These changes move concepts of learning and education practices towards more multi-layered practices that extend beyond what is understood as ‘education’ to include wider forms of learning, such as hobby-based learning or incidental learning.

The current project was tasked with identifying, documenting and assessing obstacles and opportunities, and analysing current practice among adult educators with OER in order to develop guidelines for structuring learning and teaching opportunities relevant to educators’ open educational resource (OER) engagement. In determining how best to support educators’ learning with and from OER, it was necessary to consider not only the nature and structure of learning opportunities they require but also the knowledge and content these opportunities should encompass. This paper explores the ways knowledge is being (re)generated and used by educators as they learn new practices with and through OER. It employs Tynjälä’s (2008) model of integrative pedagogies to address the research question: *What types of knowledge do higher education educators have to learn to adopt open educational practice?* The paper begins by positioning the study within the professional learning literature, with particular focus given to the different types of knowledge educators require when innovating in their practice. This is followed by a discussion of the qualitative methods employed by this study to explore how educators conceptualised the different types of knowledge they constructed when engaging with OER. The findings and accompanying discussion are then presented, together with reflection on their broader implications and potential directions for future study.

2.0 Literature Review

The Cape Town Open Education Declaration (CTOPD, 2008), a founding document of the OER movement, suggests that open education has the potential to ‘empower educators to benefit from the best ideas of their colleagues’ and to adopt ‘new approaches to assessment, accreditation and collaborative learning’. Open education initiatives have predominantly focused on creating and publishing educational content (Stacey, 2010), for example MIT’s OpenCourseWare project, which was designed to make freely and openly available all of MIT’s course materials. While these efforts have increased recognition of knowledge as a public good and in theory have increased people’s access to high quality information and materials, they have not changed education practice as quickly or as widely as originally anticipated (Ehlers, 2011; OPAL, 2011). Change in practice requires not only access to resources but also

new learning models and new types of knowledge that encourage and facilitate use of the resources (Eraut, 1994, 2000; Tynjälä, 2008). As a result, there is a new focus in open education away from foregrounding educational resources, towards emphasising the practices involved in utilising, remixing and repurposing these resources.

Open education practices (OEP) are defined as practices which support the (re)use and production of OER through institutional policies, promote innovative pedagogical models, and respect and empower learners as co-producers on their lifelong learning path (Conole & Ehlers, 2010; OPAL, 2011). Research suggests that while there has been some adoption of OER among educators, there has been limited re-sharing and little understanding of the changes in practice that OER enable (Banzato, 2012). A study examining the barriers to OER and OEP uptake found that institutional policy barriers, a lack of skills and time of individual practitioners, and issues of OER quality all affected uptake (OPAL, 2011). Further studies suggest that the adoption of OEP results from experimentation in practice by educators and learners (Lane & McAndrew, 2010) as well as changes in beliefs and attitudes around resources, curriculum and acts of teaching, which are underpinned by change in institutional culture (Beetham et al., 2012).

The continued professional learning of educators is a critical component for ensuring on going improvement and innovation in education and the adoption of new practices. Research suggests that professional learning is optimised through the integration of formal learning opportunities with informal, on the job learning, which enables practitioners to engage with and learn from workplace tasks, new opportunities and other people (Collin, 2008; Eraut, 2000; Tynjälä, 2008; Unwin, Felstead, & Fuller, 2004). Learning arises from internal drive and personal agency while also being distributed across numerous resources, materials and people (Drent & Meelissen, 2008; Spillane, 1999) and shaped by the individual's connection to and interaction with their environment. As such, workplace learning operates as a reciprocal process (Billett, 2004) shaped by the affordances of a specific workplace, together with an individual's ability and motivation to engage with what is afforded (Billett, 2004; Fuller & Unwin, 2004).

This conception of professional learning aligns with Reeves' (2010) finding that 'teachers did not construe their learning as the simple acquisition of knowledge and skills but as a far more complex process embodied in changes to their relationships with people and things'. The literature suggests that engaging with OER can promote change in educators' practice, including modifying attitudes towards curriculum and content (Beetham et al., 2012; Casewell, Henson, Jensen, & Wiley, 2008), increasing their reflection on current practice (Beetham et al., 2012) and the fostering of new, more collaborative methods of working (Beetham et al., 2012; Lane, & McAndrew, 2010). Ehlers and Conole (2010) further suggest that engaging with OER can lead educators to adopt new roles, taking a more facilitative approach to their teaching, rather than the more conventional focus on content delivery. Ertmer and Ottenbreit-Leftwich (2010) suggest that there are four critical variables for supporting change in teachers' practice around technology: explicit knowledge, self-efficacy, pedagogical beliefs, and culture. Studies suggest that educators require content knowledge of the technology (Borko & Putnam, 1995; Lawless & Pellegrino, 2007), the pedagogical knowledge to effectively integrate technology into their practice (Windschitl, & Sahl, 2002; Zhao, & Frank 2003), self-efficacy and confidence in using the technology to

support student learning (Bauer, & Kenton, 2005; Wozney, Venkatesh, & Abrami, 2006), and a context that supports ongoing learning and use of technology (Zhao & Frank, 2003).

This intertwining of formal and informal learning activities with socio-cultural and socio-regulative knowledge in shaping the ways knowledge is being (re)generated and used by the educators as they learn new practices is consistent with Tynjälä's (2005, 2007, 2008) model of integrated pedagogies for professional expertise [Figure 1].

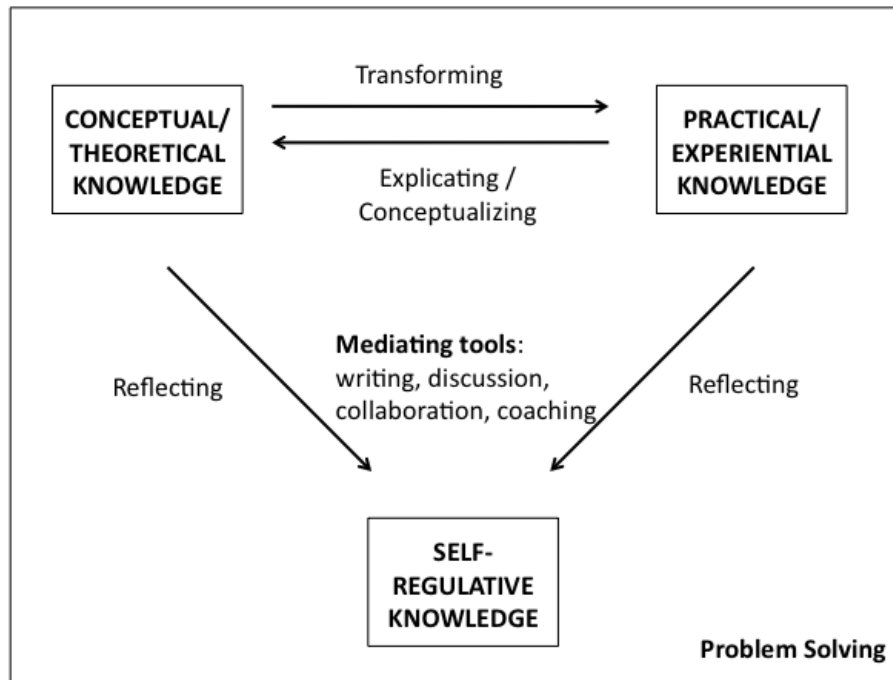


Figure 1: Tynjälä's Integrative Pedagogies model for developing professional expertise

The model emphasizes the importance of developing connections between the learning that takes place in different educational and work contexts and the need for both situated learning and generic knowledge for expertise development. Tynjälä (2008) suggests that alongside the development of conceptual and theoretical knowledge, professional learning should also promote self-regulative knowledge creation. Theoretical knowledge is formal and explicit, making it easily transferred between contexts. In contrast practical, experiential knowledge is more personal and tacit in nature, and is typically constructed through engagement in practice. The importance of integrating these two types of knowledge for workplace learning is widely recognized (Eraut, 2004; Eraut & Hirsh, 2007; Nonaka, 1994; Unwin, Felstead, & Fuller, 2004), however, Tynjälä's third knowledge type, self-regulative knowledge, is less commonly discussed in relation to workplace learning. Yet self-regulative knowledge forms a critical component of the learning model, incorporating the knowledge and behaviors that allows learners to monitor and evaluate their own actions and to make sense of and apply the knowledge and expertise they are creating within the varied contexts of their professional practice. It aligns closely with Schon's (1983) theory of the reflective practitioner, which positions the capacity to reflect on action as pivotal to continuous learning within a professional's practice.

Tynjälä (2008) presents the development of professional expertise as a form of problem-solving (Scardamalia & Bereiter, 2002), where individuals draw upon mediating tools to support them in transferring and combining formal knowledge into flexible, situated tacit knowledge that is structured around a particular activity or practice-based task. Here, socio-cultural knowledge, developed through interactions with individuals, the setting of action and other resources becomes an important component of the theoretical framework. The mediating tools in Tynjälä's model become key resources in the construction of socio-cultural knowledge.

The integration of multiple pedagogies aligns with Eraut's (1994) suggestion that learning does not occur when an individual encounters new information, but rather through use of this information. It is through being enacted that an idea gets reinterpreted and acquires new meaning, which is specific to the individual and their context. This moves beyond the learning as acquisition metaphor (Hakarainen & Paavola, 2007; Sfard, 1998) to the conceptualization of learning through participation and construction. This conception of learning as analogous to innovative inquiry also aligns with Kolb's (1984) experiential learning cycle, which considers knowledge to be created through the transformation of experience. Kolb sees learning as moving from concrete experience, through reflective observation, abstract conceptualization and finally active experimentation, as the learner applies new knowledge in practice. Learning therefore occurs within the internal psychological setting of the individual (thinking) as well as through the actions of an individual, which are situated within a particular environmental context (Illeris, 2007).

3.0 Methodology

This research forms the phase two of a mixed methods study investigating how educators learn from and with OER. In phase one, data were gathered using a modified version of a validated instrument for measuring self-regulated learning in the workplace (Fontana, Milligan, Littlejohn, & Margaryan, 2015). The modifications were to ensure participants answered the questions in relation to their engagement with OER in their professional practice, and did not alter the phrasing of individual items. The survey instrument is comprised of three scales. The first scale asks educators about their current engagement with OER. The second scale measures the influence of educators' workplace context on their learning, and the final scale measures educators' ability to self-regulate their professional learning when engaging with OER.

The first phase of the study involved 521 adult educators from across Europe completing a survey detailing their learning behaviour around OER. The primary target group were United Kingdom-based adult educators, however, the nature of sampling process and the use of social networks to distribute the survey resulted in participants from across Europe. 468 of the participants were university level educators, 19 school educators, 7 vocational educators, 16 company or professional trainers, 5 lifelong learning facilitators, 3 community educators and 3 voluntary or third sector trainers. Experimental factor analysis identified six factors of self-regulated learning in relation to OER use: experimenting in practice, planning and goal setting, self-efficacy, self-reflection, interaction with others and learning value (Littlejohn & Hood, 2017).

Upon completion of the survey participants were invited to participate in a semi-structured interview. The purpose of the interview was to explore in greater detail educators' behaviour and actions when engaging with OER in their workplace practice and how they conceptualised the learning process this entailed. A semi-structured interview instrument was designed to probe five areas: (1) the context of OER use; (2) the role OER play in professional learning; (3) the use of OER in practice; (4) exploration of specific examples of OER use. Interviews were conducted via phone or Skype and were recorded and transcribed verbatim. The quantitative data were analysed prior to the interviews to provide a baseline for discussion with each interviewee. This method has previously been used and validated (Milligan, Rosa, Littlejohn, & Margaryan, 2014).

30 participants, all of whom were employed as university level educators, were selected to participate in the interviews [Table 1]. The sampling process was designed to ensure that interview participants had a range of overall perceived level of self-regulated learning, as determined by their responses to the survey (from 210 to 58), and various levels of knowledge and use of OER. The sample included educators from eight countries, with a majority from the United Kingdom, reflecting the geographic distribution of survey participants (Littlejohn & Hood, 2017). While included educators who engaged with OER in a variety of ways and had a range of SRL scores, it became evident during the data analysis process that these differences did not greatly influence or impact the themes emerging from the data. Consequently, in our analysis process we did not use the different levels as analytical variables. Instead we analysed the data from all interviewees collectively.

Table One

Interview participants' professional roles, age, level of OER use and overall SRL score

Participant ID	Professional Role	Age	Gender	Knowledge and use of OER/OEP	Overall perceived level of Self Regulated Learning (SRL)
44	Lecturer and researcher	60	M	High	210
265	Lecturer	53	F	Medium	210
581	Lecturer and researcher	42	F	Medium	192
526	Lecturer	62	F	Low-medium	191
138	Lecturer	65	F	Medium	188
281	Lecturer and researcher,	59	F	Medium	187
92	Lecturer	53	F	Medium-high	185
370	Lecturer and researcher,	66	M	Low-Medium	184
243	Lecturer	61	F	Low-Medium	184
67	Researcher and course convenor	61	F	High	180
248	Lecturer and	58	M	Medium-high	172

	professional development provider to teachers				
549	Lecturer and instructional designer	57	F	Medium	158
29	Lecturer	51	F	Medium	165
689	Lecturer and course convenor,	40	F	Low-Medium	160
19	Lecturer and researcher,	53	F	Medium	158
551	Lecturer	44	M	Low-medium	58
207	Lecturer	44	F	Low	156
234	Lecturer	70	F	Low	156
104	Lecturer and Librarian,	53	F	Medium	156
66	Lecturer and researcher	62	M	Medium	155
33	Lecturer and PhD student	44	F	Low-Medium	154
271	Lecturer	70	F	Low	150
573	Lecturer	61	M	Medium	145
524	Lecturer	69	M	Low	144
369	Lecturer	56	M	Low-Medium	143
124	Lecturer	55	F	Low	142
534	Lecturer	67	M	Low	140
504	Lecturer	39	F	Low-Medium	123
118	Lecturer	56	M	Low	118
594	Lecturer	61	M	Low	101

The interview transcripts were initially analysed utilising the three factors that emerged from the experimental factor analysis of the OER activity scale survey data during the quantitative analysis. The factor analysis yielded a three-factor structure – ‘resource employment’, ‘resource evaluation’, and ‘resource knowledge development’ – aligning with Wild’s (2012) three ‘realisation steps’, which represent the learning processes that facilitate movement between the four levels of engagement with OER – from no engagement to embedded engagement. The three factors further relate to the different types of knowledge teachers must develop in order to support the integration of technology in their professional practice. These three categories of knowledge, together with the six self-regulated learning sub-factors and two workplace learning context factors identified through the experimental factor analysis, were used to structure the first round of qualitative data analysis.

At the end of the first round of data analysis, it became evident that, while the factor structure derived from the quantitative analysis was a good fit for the qualitative data, it did capture the full extent of the learning and knowledge construction educators were undertaking when engaging with OER. In the second round of analysis the three initial categories of knowledge – ‘resource employment’, ‘resource evaluation’, and ‘resource knowledge development’ – were overlaid with Tynjälä’s (2008) integrative pedagogies model. With its focus on expertise development, the integrative pedagogy

model offers a fresh perspective on professional practice, which is well suited to the construction of new learning practices around OER. The Integrative Pedagogy Framework identifies additional knowledge areas that must be supported in order to provide comprehensive learning opportunities, including socio-cultural knowledge and self-regulative expertise. These forms of knowledge are more routinely developed through the informal learning that occurs in and through the acts and tasks of practice and are embedded within the workplace contexts of educators. The data were coded using the three knowledge categories of Tynjälä’s model (1) conceptual theoretical knowledge, (2) practical experiential knowledge, and (3) self-regulative knowledge and the additional code of socio-cultural knowledge. While socio-cultural knowledge or learning context is implicit in Tynjälä’s model, it takes a more explicit position in both the quantitative and qualitative data in this study and this was reflected in the final coding structure. A subsequent round of analysis determined that the data within two of the coding categories could be further reduced into sub-sections, generating 6 knowledge types [Table 2].

Table two

Coding category definitions for 6 types of knowledge supporting adult educators’ engagement with and learning from OER

Knowledge type / code	Description
General conceptual/theoretical knowledge	Includes a wide range of concepts relevant to all OER engagement, including knowledge of: licensing and legal frameworks; technical and hosting; quality assessment; locating OER; adaption and repurposing of OER; pedagogies of OER employment.
Specific conceptual/theoretical knowledge	Context specific theoretical knowledge that is directly relevant to their discipline area and workplace context.
Practical/experiential knowledge	Encompasses the skills and expertise required to implement learning and to engage with and utilise OER in practice.
Self-regulative knowledge	Meta-cognitive and reflective skills that educators use to monitor and evaluate their own actions and to make sense of and apply the knowledge and expertise they are creating through their engagement with OER in their professional practice
Socio-cultural knowledge (community based)	Knowledge developed through and enabling educators to interact with other educators around their OER engagement.
Socio-cultural knowledge (workplace based)	Knowledge of OER in and for specific workplace settings.

The final round of coding involved identifying the learning strategies associated with each knowledge type, with particular attention given to identifying differences that emerged between educators who were more and less proficient in utilising OER in their practice.

4.0 Findings and Discussion

Six types of knowledge connected to OER use were identified during the analysis process. Each of these six knowledge types is described in this section.

4.1 Type one: general conceptual/theoretical knowledge

Conceptual/theoretical knowledge encompasses the content and technical knowledge that informs educators' OER engagement. It includes knowledge of: licensing and legal frameworks; hosting; quality assessment; locating OER; adaption and repurposing of OER; pedagogies of OER employment. This knowledge is largely explicit and systematic in nature, making it easily communicable through formal learning activities. The interview data suggest that the specific elements of conceptual knowledge that educators are concerned with differ depending on their current level of proficiency with OER.

The more basic, programmatic information related to licensing and legal frameworks and basic adaption and repurposing of OER is most beneficial to educators in the initial stages of their engagement with OER. Eighteen participants mentioned the importance of developing theoretical knowledge to underpin their OER use. This knowledge was typically developed through more formal style learning activities, such as courses or seminars. One participant, who had experience in running training courses for other educators on OER and possessed strong conceptual/theoretical knowledge of OER, described the importance of grounding educators' understanding of OER in a strong theoretical framework:

I start the talk about creative commons and copyright. ... First of all people are not that used to creative commons. They don't really understand the alignment with open educational resources and with creative commons. Some think that everything that is on the Internet is like open educational resources. Then I show a lot about good examples and what you can do and what you can't, how you can use it. [67]

She went on to explain that conceptual/theoretical knowledge also encompasses building understanding of the roles OER can play in practice:

To get people to realize that they can save time and money and they can also get the best professors from all over the world if they are working with open educational resources. [67]

Data suggest that general conceptual/theoretical knowledge provides the foundation from which educators can interpret specific OER and situate their practices and actions around OER use. A participant who has become a high user of OER suggests that developing this theoretical knowledge of OER has led to changes in how he engages with and assesses resources:

... its making us more careful about source material and about judging and assessing and attributing source material ... when it comes to OER its sometimes not always obvious what it is and that is making us a lot more critical about the origin of the material we are using. [44]

Conceptual/theoretical knowledge aligns with the first step of engagement in Wild's (2012) ladder of OER engagement, which identifies four major levels of engagement

– none, piecemeal, strategies, embedded – educators proceed through when building new practices around OER. Wild suggests that a key component of building initial understanding of OER requires basic awareness of OER and creative commons licensing as well as recognising the unique value, often contrary to traditional beliefs, that OER can provide by positioning the reuse of materials created by others as a form of good practice. Guskey (2002), in his model of teacher change, suggests that changes in beliefs and attitudes occur only after and as a result of changes in practice. Therefore, the development of conceptual/theoretical knowledge, which supports change in practice, is critical to changing educators’ beliefs.

Twenty-five participants identified changes that had occurred in their practice, which they attributed, at least in part, to their engagement with OER. However, the level and extent of change to practice varied in depending on an educators’ level of engagement. Increased engagement with OER was frequently connected to a shift in an educator’s practice away from individually producing original materials, to recognising the benefits that can come from remodelling and repurposing existing resources. One participant described the process she now goes through when planning a course:

I [am] more proactive about saying ‘Hang on let’s think about the different ways we might want to deliver things and different resources we can pull in rather than producing stuff ourselves’. [689]

As educators’ familiarity with OER increased, so too did the range of OEP they employed. This most commonly manifest in a shift from focusing on the reuse of resources to the re-purposing and re-modelling of resources. One participant explained her evolving engagement with OEP:

So the difference is that you can improve your materials every time you want to and you decide that it is necessary. I improve it and I change it according to the new students and every time I can go into the materials and update news and update references, add new content. All the materials that we used to use were static. [29]

4.2 Type two: specific conceptual/theoretical knowledge

In order for educators to develop the necessary levels of digital literacy, where their actions and learning around OER are embedded within their practice, it is necessary for them to have knowledge and expertise that is specific to and situated within the personal settings and contexts of their work. Nineteen participants indicated that they are more motivated to engage in learning with OER when they can easily see the relevance to their own work. Expertise development is enhanced and knowledge is more readily assimilated and internalized when it is directly translatable to the contexts in which it will be utilized. The importance of discipline specific knowledge construction was described:

You’ve got someone who’s got a subject interest. I know this has happened in pockets and I think this is the problem with it, there’s pockets of really good practice around the country but I don’t think there’s enough connectivity with curriculum specialism and OERs across the piece. [104]

These ideas of discipline specific knowledge are further explained by another participant:

Judging the effectiveness of them. So knowing when they're going to be useful and when they're not and having tried out some of the techniques used within those resources whether they work or not for my students and for my discipline. [265]

As all knowledge is contextually mediated, and educators interpret and develop their practice for a specific setting and audience, it makes sense that alongside general theoretical knowledge they also require specific theoretical knowledge. Engaging with context-specific theoretical/conceptual knowledge limits the degree to which educators have to transpose knowledge from its original context into their own context of use. This reduces the cognitive load on educators and facilitates the learning process.

Alongside discipline specific knowledge nine educators also described the importance of constructing conceptual knowledge in relation to specific types of resources. Different types of resources require different repurposing and adaptation. Educators, especially as they gain greater familiarity and competence in engaging with OER, require additional conceptual knowledge to facilitate specific reuse and repurposing processes. One participant described the importance of developing a range of technical expertise:

I would say possibly if I was more confident in how I could repurpose, it does depend what the OER is of course. If it's been made with something quite sophisticated I still don't understand quite how to pull it apart and I suppose that's my technical development needs really.[104]

Another participant, who has low engagement with OER, elaborated on the specific nature of the learning she felt she requires to develop specific, theoretical knowledge:

I needed someone to come and sit next to me and help me manage the software. Now I went online to a moderators course, but it's not really very helpful, you really need someone to sit there and help you actually modify something rather than just saying 'Click on this and move that' from a distance. [234]

This quote describes the importance of developing the specific technical knowledge for enabling educators to feel confident engaging with particular types of resources as well as more advanced OER. It also suggests that educators need to develop practical/experiential knowledge alongside and in conjunction with conceptual/theoretical knowledge.

4.3 Type three: practical/experiential knowledge

Twenty-one educators mentioned that they are more likely to learn about and use OER if their learning and knowledge construction are connected to and situated in their day-to-day work tasks. Alongside understanding the theory behind OER and how OER can support and enhance their ongoing practice and professional learning, educators also require the skills and know-how to enable them to engage effectively with OER. Practical/experiential knowledge refers to the tacit, practice-based knowledge educators construct when using and experimenting with OER in their practice and encompasses the skills and expertise that facilitate these actions. One participant described some of the learning activities that can support the development of this knowledge:

I love a step-by-step guide. You know, this is how you do it. Actually showing you, a bit of a show and tell, hands on opportunity, something I could follow, examples of how it's been done. [104]

While a step-by-step guide may provide the overarching structure to facilitate the construction of practical/experiential knowledge, it is through tinkering and experimenting in practice, and through reflection on actions that educators are able to develop the rich, situated knowledge they require to effectively integrate OER in their practice. Eleven participants described the role that experimentation played in their learning. The following exchange describes how this process occurred for one participant, who now has medium use of OER:

Interviewer: So your own experience using a variety of different online resources then informs your future use of them?

Educator: Yes absolutely. Because you can very quickly see that one's not going to be any good for me. I don't want that source. I've seen that one before. Oh yeah, I like this guy, let's have a look at what else there is in this particular website or from this particular university or school. And so you kind of just get to know. It's like getting to know the library really, which bits you want to go to and which bits you don't and which authors you might want to use and which you don't. It's just getting to know them really. [265]

This iterative accumulation of knowledge through engaging with OER and experimenting in practice aligns with the literature on how teachers' create knowledge (see for example Elbaz, 1983; Hargreaves, 1996; Huberman, 1992), which suggests that as educators develop their repertoire of instructional strategies they are also constructing a more complex set of mental schemata (Huberman, 1992). Consequently, the construction of practical, experiential knowledge also is connected with the development of new pedagogical knowledge, and changes in the way educators approached their teaching practice. All but five participants attributed pedagogical changes to their practice to their utilisation of OER. One participant, who overall exhibited low to medium OER use, explained:

So certainly yes and I think in a sense it also exposed me to the notion of that one may have different kinds of philosophical approaches to education and learning and the way that it was delivered ... because I made a huge step from traditional face-to-face teaching to the notion of blending that with more online work and developing the teaching capabilities to be able to do that successfully or at least attempt to do that successfully. [369]

The data further suggested that engaging with OER led educators to think more creatively about how they presented content and materials to students, and encouraged educators to 'present this information to students in a variety of ways and a variety of contexts' in order to make it 'more relevant, not just to the course content, but the way it fits within a discipline as a whole'. [265]

Practical, experiential knowledge represents the knowledge that is constructed when educators apply theoretical/conceptual knowledge in the contexts of their practice. It forms part of the knowledge that is created through participation in and through the acts and tasks of practice. Its construction, therefore, is reliant not only on having the

requisite theoretical knowledge but also the self-regulative knowledge and socio-cultural knowledge or contextual conditions to support on going experimentation and reflection.

4.4 Type four: self-regulative knowledge

Self-regulative knowledge supports educators' understanding of the value of OER both for their own practice and for their students' learning and development. It consists of the meta-cognitive and reflective skills that learners use to monitor and evaluate their own actions and to make sense of and apply the knowledge and expertise they are creating within the varied contexts of their professional practice. Wild's (2012) model identifies reflection as a critical learning process for moving from medium to high-level use, where engagement with OER becomes embedded within an educator's practice. The data from this study suggests that reflection, as one component of self-regulative knowledge, is critical for educators at all levels of OER proficiency. It mediates the transposition of knowledge from theory to practice and supports educators' construction of theories of practice through engaging in acts of practice (Timperley, 2013).

For fifteen educators, their self-regulative knowledge is constructed primarily in relation to their own practice and actions. As one participant described:

I would check it met my learning objectives, check the quality, where it's come from. Was it indeed available anyway as an open educational resource? Could I use it? Is it going to meet my needs? And is it easily accessible? [104]

In this instance the self-regulatory behaviour is concentrated on the actions of the individual educator in relation to primarily structural and fundamental elements of OER, such as licensing. This form of self-regulation was most common among educators exhibiting lower levels of proficiency with using OER. In contrast, educators who are more confident in their engagement tend to concentrate on higher-level, pedagogical considerations. This is frequently associated with a shift in the focus of their reflective behaviour from themselves to their students, as was discussed by eight participants. One participant explained how the process of developing student-oriented, self-regulative knowledge occurred:

So I try to put myself in the students' position . . . but I do try and see things from the students point of view and I do, I guess I limit my focus, I concentrate my focus on content specific topics more so than I did in the past. I think would this be really, really useful to someone studying this particular concept at this point in the course? [370]

Self-regulatory knowledge also appears to be connected to the development of OEP and new pedagogical practices involving OER.

... seeing whether they are actually just showing something in a different way which might be slightly more whizzy bangy and exciting or are they actually genuinely helping the learning? In other words, have they got a decent pedagogical basis or is it just alright, that's nice, it's a video. We'd only really be using a video if it's actually helping and again it comes back to the topic. [504].

The same self-regulatory processes that educators employ when selecting teaching materials and planning their classes also are applied in the assessment and employment of OER and OEP.

Developing high levels of self-regulative knowledge in educators is important for OER adoption and learning. The more convinced an educator is of the positive influences reusing and repurposing OER has on their practice, the more likely they are to continue to engage in these practices. The participant, who has the highest overall SRL score as well as high levels of OER use explained,

Again when I need to learn something whether it's a subject matter business or whether it's a question of learning profession skills - well of course I am going to go for OER aren't I? [44]

OER have become a primary learning activity and knowledge source across multiple domains of his professional practice.

It is through the development of self-regulative knowledge that educators are able to shift their engagement with OER from a supplementary component of their practice to an integral, embedded element of practice. While overtime the construction of self-regulative knowledge often becomes an habitual part of educators' practice, data suggest that it is a learned skill, and something that educators, particularly in the early stages of their OER use, must consciously cultivate and develop. One participant described how this process has occurred for her:

I like to think I'm quite a reflective practitioner and I think that is a skill I have had to learn, it wasn't something I was particularly good at, but I have developed that over time because it's helped me think well how well did that go? How well was that resource meeting the needs of my learners? And how could I perhaps use it in the future again? [104]

As OER use becomes more embedded in practice, the learning processes associated with self-regulative knowledge construction increasingly become habitual. Educators instinctively and intuitively will engage in the reflective behaviours, which develop the different types of knowledge they require to develop and strengthen their practice. One participant, who has a high overall SRL score, and medium OER use, described his experience:

I think a lot of it is subconscious and unconscious. But as I'm looking at something, you know is this really the nitty gritty though? Is this good information? Does it add something? Will it enhance a 1st year students understanding? So I do ask those questions, but it's done unconsciously I think to a large extent. [370]

4.5 Type five: socio-cultural knowledge (community based)

Socio-cultural knowledge is developed through the primarily informal learning opportunities that emerge as educators engage and interact with one another around their OER engagement. The data indicate that educators with all levels of experience 3in both online and offline settings to support change in practice. For educators with low levels of engagement with OER, identifying people or sources that they can trust is important to ensuring their continued engagement with and learning from OER. For

educators with higher levels of engagement with OER, socio-cultural knowledge supports their continued reuse and repurposing of materials as well as encouraging them to share or re-share resources they have constructed in their own practice.

Twenty-seven participants identified the importance of socio-cultural knowledge in the expansion of their practice. One participant, with high levels of engagement with OER and OEP, described how the construction of socio-cultural knowledge had not only been instrumental in developing her own proficiency with OER but had provided her with the support network that would allow her to continue to grow and develop:

If I hadn't had the social media and the contacts which I have, I couldn't have been updated in that way which I am and haven't had those contacts because now I can more or less write to anyone in the world and ask them for things. [67]

Motivation is critical for supporting professionals' engagement in continued learning in the workplace (Gagne & Deci, 2005). Data from this study suggest that socio-cultural knowledge is central to building and sustaining educators' motivation to learn with and from their engagement with OER. Social interaction facilitated the construction of affective support networks as well as facilitating insight into new perspectives around OER. One participant, with low to medium engagement with OER, described the range of people within his institution who could support his learning of and through OER:

There were sort of technologists and learning developers and people who would meet very regularly. I had the opportunity to discuss aspects of those things there, which was always incredibly useful at looking at what people were actually doing and how they were going about these things in slightly different ways. [369]

For this educator, social interactions and the construction of socio-cultural knowledge was closely aligned with practical, experiential knowledge development, and the opportunity to gain more concrete strategies for supporting his engagement with OER.

Socio-cultural knowledge was closely aligned with the creation of trust, with eleven educators discussing the importance of interpersonal connections for developing trust. As one participant described:

I trust you and you share something with me and then I would like to share it again, but if I don't trust you I will not share what you're sharing. So I mean there is some kind of a self-evaluation built in, in this kind of system which is not present in for example a peer reviewed journals. [67]

The importance of trust in shaping educators' engagement with OER aligns with findings of studies of online knowledge sharing, which identify trust as a critical variable in supporting and mediating individuals' behaviour (Chen & Hung, 2010; Haythornthwaite, 2007; Matzat, 2010; McCully, et al., 2011; Wasko & Faraj, 2000; Wellman, 2001). The data from this study indicate a reciprocal relationship between trust and socio-cultural knowledge development. Interaction and socio-cultural knowledge construction facilitate the creation of trust, while the existence of trust also supports on-going socio-cultural knowledge creation.

The development of new social ties can provide both the impetus and access to new knowledge to support educators in changing their pedagogical approaches. These interpersonal connections did not always have to be close ties or involve direct exchanges. Five participants described the value of viewing examples of other educator's practices, without actually engaging directly with the educators themselves. As one participant, who had moderate levels of engagement with OER explained:

I'd say actually getting a lot of information myself about education, approaches to education, different ways of doing things, I get a lot from looking at examples of what other people have done. Templates, even for different kinds of lessons or different kinds of things that I've found online. [19]

For eight participants, socio-cultural knowledge was developed not only through connections with their colleagues but also through interactions with their students. As educators become more confident in using OER, they often encourage their students to engage with OER, which can lead to new learning opportunities for both practitioners and students. One educator described how this process of learning from and with his students had developed in his practice:

Now our students will teach us, the lecturer, things. We will get things from the students, especially that they put in their assignments, which show an online understanding which is completely different to how it used to be. [551]

This changing dynamic between educator and student also prompted changes in the pedagogical practices of eight participants, who have moved away from the role of the didact, to adopt the role of facilitator of learning. One participant, who had moderate levels of engagement with OER, described how this change had manifest in her practice:

I think I work in a way that I get students today to be much more proactive, much more independent in terms of managing their own learning, like I tend to throw things out to them and say 'The resources are there, the information is there, it's up to you now to go and find it and to think about it and bring something back.' Which I didn't do before so much at all, you know I was doing a lot more prescriptive type teaching. [19]

Adopting the role of facilitator and employing OER as the primary teaching and learning materials in her practice led another participant to completely reorient her approach to assessment. She explained:

Then my assessment completely changed from assessment of learning to assessment for learning. So everything they [students] do that I assess is part of the learning journey. So my assessment has changed completely, 180 degrees changed from assessment of learning to assessment for learning. [92]

4.6 Type six: socio cultural knowledge (workplace based)

Socio-cultural knowledge was associated not only with social interactions but also the construction of knowledge in and for specific workplace settings. Similarly to the

findings of previous studies (Billett, 2004; Eraut, 2004; Hood et al., 2015), educators' workplaces in this study were a powerful mediator of ongoing learning. New knowledge and learning is generated in and through an individual's participation within their context of practice as well as the interactions and engagement with the resources (material and human) available in that context. Each workplace has its own culture and set of principles guiding practice, and learning is best supported when educators engage with resources that are aligned with their workplace culture.

Thirteen participants identified the role that particular workplace structures play in shaping knowledge construction. For one participant, teaching a course that is entirely online had important implications for the types of knowledge she required:

It would be most relevant if it was colleagues at this university because it would be other people in similar situations to me. There wouldn't be an awful lot of point in having a bank of resources that was from people who were in a brick university because when I was at the conference last month the kinds of things that were issues for people in brick universities were totally different to our issues. So whilst some of the resources could theoretically be applied or useful, there's no point in some because it's a different situation. [504]

In this instance the structure of the university influenced the nature of the knowledge the educator needed to construct. For other educators knowledge construction was related more closely to their departmental context.

Educators often found that constructing knowledge that was specific to their institution or department supported their on going learning with and from OER. As one participant with low to medium levels of engagement with OER explained:

I think one of the problems is often you're looking for something that's very specific and your context is different to other people. So often you find a resource that's kind of close to what you want, but actually it doesn't quite hit the spot and that's why for hundreds of years universities have each been doing their own thing. [689]

Another participant, with similar levels of engagement with OER, described how the establishment of systems and structures within his workplace has supported his knowledge construction:

So in each of our subjects there will be a conference that's just for lecturers and indeed for the course teams and that's a conference where we can share best practice resources and information and moan and whinge a bit, but we can also share best practice. So if people are at a bit of a loss saying 'I've got this vast subject of art in Africa, how the hell am I going to start looking? Where do I start?' pop into the lecturers only conference and you'll be able to post a question and get an answer pretty quickly from someone who's gone through exactly the same problem ... [551]

The data indicate that educators who consider their workplace to foster a learning context that provides them with greater freedom and flexibility to pursue activities and learning opportunities that will be most beneficial to their specific needs were more likely to engage with OER to support the development of their practice and learning.

5.0 Conclusions

The qualitative findings presented in this paper build upon the quantitative component of this study to validate Tynjälä's (2005, 2007, 2008) model of integrative pedagogies for professional expertise development. The Tynjälä model can be applied to various professional learning contexts. In this study we position educators' knowledge development as a subset of professional learning and apply the model to investigate the types of knowledge educators develop as they learn to use OER. The findings of this study build upon Tynjälä's three knowledge types for expertise development, to present six types of knowledge as integral to supporting educators' ability to learn new practices with and through OER. These knowledge types are general theoretical or conceptual knowledge, specific theoretical or conceptual knowledge, practical or experiential knowledge, self-regulative knowledge, socio-cultural knowledge (community-based) and socio-cultural knowledge (workplace-based). While the role of socio-cultural knowledge and situated learning are implicit in Tynjälä's model, they emerge as critical components in educators' learning with and from OER.

These data highlight two critical components for educators' professional development. First educators require access to multiple types of knowledge to develop new practices. Second, educators have to be able to move fluidly among these different kinds of knowledge for their practice to evolve. Socio-cultural and socio-regulative knowledge are critical to this movement, reinforcing Harteis & Billett's (2008) contention that the workplace is a site where learning is both undertaken and applied. It is through using and adapting multiple types of knowledge in the workplace setting that educators are able to build new understandings and to expand their practice. Reflexivity is a central component in this process and self-regulative knowledge acts as a mediating mechanism between theoretical/conceptual knowledge, practical /experiential knowledge and socio-cultural knowledge. As such, the qualitative findings reinforce the model developed from the quantitative component of this study (Littlejohn & Hood, 2017), which positioned three self-regulative learning processes (self-reflection, interaction and learning value) as a bridge between OER activity and workplace context.

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The emergence of six knowledge types has profound implications for the structure of learning opportunities around OER. Across the six types of knowledge there appears to be an inverse relationship between the generalizability of knowledge and the depth of knowledge that is required by educators. Knowledge types one and two, theoretical/conceptual knowledge, largely are explicit in nature, making them easily transferrable across sites, and able to be attained through formal learning activities. The data suggest that this knowledge is generalizable and applicable to educators in a range of contexts. Knowledge can be learned through educators' engagement in formal learning activities. However, theoretical/conceptual knowledge alone does not encompass all types of knowledge that educators require to continue to extend and adapt their practice. It appears that to change their practices, educators must move beyond generalizable know-what and know-how to construct deeper knowledge through the application and embedding of knowledge in practice. Informal (on-the-job) learning opportunities, which are situated in the contexts of educators' practices and therefore emphasise practical/experiential knowledge, appear to support the construction of this deeper knowledge. The data suggest that learning activities that support socio-cultural and self-regulative knowledge construction may facilitate

educators' ability to traverse and build connections between generalizable and deeper knowledge.

In conclusion, the ebb and flow of knowledge, from general, abstract knowledge to focused, embedded knowledge, seems a critical aspect of educators' professional learning. While theoretical / conceptual knowledge can be learned through courses or reading, it is the application of knowledge in work contexts that results in a deeper understanding. This applied knowledge is tightly bound in specific work settings and, therefore, less easy to generalize. This finding has implications in terms of what education professionals can be 'taught' and what has to be learned on the job. It also suggests the need for research that focuses on the utilization and application of OER in a range of different contexts. The situated nature of knowledge that educators require for their work indicates the need for further research that explores the learning processes surround educators' engagement with OER at different levels of the education sector – school-level, university-level, technical colleges and further education – as well as across different subject areas.

As with any study there are a number of limitations influencing the findings and the conclusions that can be drawn. The sample only included participants who were employed in universities, meaning that adult educators in other higher or further education sectors and institutions are not represented in the findings. Further research, which examines the learning behaviours and actions of adult educators in other contexts, could provide deeper insight into learning behaviours with OER. The interview schedule was designed to elicit narrative descriptions of educators' learning with and from OER, and therefore was reliant on educators' retrospective self-perceptions of the learning process and the knowledge they were constructing. Employing methods that enable the close observation and measurement of how the six knowledge types identified in this study are constructed and applied in specific instances could provide a deeper understanding of the underlying learning processes. Given the evidence from this and other studies that the nature of knowledge educators require and the learning processes they adopt change as they gain greater familiarity with OER, undertaking longitudinal studies examining educators' learning with OER overtime could produce new insights.

Despite these limitations, the findings have important implications for both researchers and practitioners. The findings confirm and build upon previous studies documenting the need for workplace learning opportunities to facilitate the development of multiple types of knowledge and the ability for individuals to move flexibly and fluently between them. The findings also provide directions for future research and practice-based evaluation of the use of OER in other fields, outside of adult education or higher learning. Perhaps most immediately would be the role of OER and educator learning around OER use in the primary and secondary school sectors. However, there is further potential to explore the potential of OER to support continued professional learning and on-the-job development of professionals and employees in other sectors. The types of knowledge identified in this study that are required to support ongoing learning are likely to be similar to those required in other sectors.

Given the European Commission's positioning of OER as a strategic priority, and their recognition that OER currently are being under-utilised in higher and further

education, these findings are particularly prescient. The inverse relationship that emerged between the generalizability and depth of knowledge educators need to expand their practice has important implications for the nature and range of learning opportunities with which educators engage. The resulting tension between what can be ‘taught’ and what must be learned in situ is relevant not only to educators’ learning with and from OER but also to the expansion of practice and adoption of innovations more generally. Any attempts to increase the use of OER and OEP by adult educators will require learning opportunities that facilitate the construction of theoretical and conceptual knowledge, as well as learning that is embedded within the practice, and contexts – social and situational or instructional – within which educators work.

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