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The Dynamic Adaptability of Vocational Bachelor's Degree Graduates in the Context of Industrial Upgrading in the Greater Bay Area: Structural Dimensions, Formation Mechanisms, and Development Pathways

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Abstract: Industrial upgrading has changed the job task structure and competency requirements in the Greater Bay Area, and has also confronted vocational undergraduate education with a structural tension between the "rapid pace of industrial change" and the "long cultivation cycle". Existing studies have mostly approached the issue from static job matching or job-seeking outcomes, making it difficult to explain how individuals "relearn" new work amid continuous industrial change. This paper proposes the concept of "dynamic adaptive capacity", that is, the capacity of individuals to perceive changes, update knowledge, and transfer and apply learning outcomes to new tasks so as to maintain occupational competence. It structures this capacity into five progressive dimensions—change perception, continuous learning, knowledge transfer, complex problem solving, and reflective innovation—constructs its formation mechanism at the three levels of the individual, the institution and industry, and further proposes a cultivation pathway anchored in the competency structure together with a closed-loop improvement mechanism. The study argues that vocational undergraduate cultivation should shift from "job-competent individuals" to "change-adaptable individuals", so as to alleviate the structural mismatch between programme provision and industrial demand. The above structure and mechanism constitute a theoretical construction and still require empirical testing.

Keywords: Vocational Undergraduate Education; Dynamic Adaptive Capacity; Competency Structure; Formation Mechanism; Greater Bay Area

1. Introduction

Since the concept of the "Greater Bay Area" was proposed in 2015, the Greater Bay Area has successively undergone an evolution from "front shop, back factory" to "collaborative innovation", and then to the building of an international science and technology innovation centre and a modern industrial system. In 2025, the total economic output of the Greater Bay Area exceeded 15 trillion yuan; in the innovation cluster rankings released by the World Intellectual Property Organization, the "Shenzhen-Hong Kong-Guangzhou" science and technology cluster ranked first among the top 100 clusters globally for the first time (Guangdong Guangdong-Hong Kong-Macao Greater Bay Area Research Institute, 2025). The upgrading of the industrial structure and the acceleration of technological iteration have made the Greater Bay Area one of the regions in China with the highest intensity of job restructuring.

The impact of industrial upgrading on talent demand is not primarily reflected in the increase or decrease in the number of jobs, but in changes to the structure of job tasks. The widespread application of artificial intelligence, industrial robots and digital twins has integrated job tasks originally belonging to mechanical, electrical and software domains into comprehensive commissioning and operation and maintenance tasks on intelligent production lines; the dissolution of the boundary between manufacturing and services has given rise to new occupations such as remote equipment operation and maintenance and data operations. The superposition of four forces—technological intelligentisation, industrial convergence, the servitisation of production, and the upgrading of value chains—has jointly pushed talent demand

from "mastering established skills" towards "continuous learning, transfer and innovation amid change" (see Figure 1). International skills forecasts point in the same direction: analytical thinking, resilience, flexibility and continuous learning are identified among the capacities whose demand grows most rapidly, while the half-life of established technical skills keeps shortening [19][20].

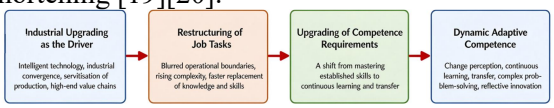


Figure 1. The Transmission Chain from Industrial Upgrading to the Competency Requirements for Vocational Undergraduate Talents

However, job tasks on the industrial side are updated on an annual basis, whereas institutions' programme offerings and course content are often adjusted over cycles of several years. Enterprises need composite talents capable of handling unstructured tasks, yet what institutions supply is single-skill training organised around fixed knowledge points (MyCOS Research Institute, 2025). The deep-seated reason for this "mismatch" lies in the fact that the existing cultivation system takes "teaching whatever current jobs require" as its logical starting point, while jobs themselves are being constantly rewritten by industrial change. Once the pace of industrial change outstrips the renewal cycle of the cultivation system, cultivation that takes static jobs as its reference will fall into the predicament of "becoming obsolete upon completion of training".

The above predicament raises a new question for research: if jobs are no longer stable cultivation targets, then what should be cultivated, and how can it be nurtured in the cultivation process? Focusing on this question, this paper addresses two interrelated sub-questions: first, what is dynamic adaptive capacity, and what is its internal structure? Second, how is this capacity formed through the interaction among individuals, institutions and industry? The former answers "what to cultivate", while the latter answers "how to cultivate"; together they constitute the core of this paper, and the design of the cultivation pathway is a natural practice-oriented extension thereof.

2. The Connotation and Structural Dimensions of Dynamic Adaptive Capacity

2.1 Conceptual Definition and Differentiation from Related Concepts

Dynamic adaptive capacity refers to the process-oriented capacity of individuals, within a continuously changing industrial environment, to perceive changes, update knowledge, and transfer and apply learning outcomes to new tasks, thereby maintaining occupational competence. The core question it answers is "when the environment changes, can I relearn and apply?". This definition contains three key points: first, it takes continuous environmental change as its premise, emphasising the dynamic updating of competence rather than a fixed stock; second, it takes behavioural composition as its object, pointing to individuals' observable and cultivable actual abilities rather than remaining merely at the level of attitudes or psychological resources; third, it takes the occupational process as its time scale, focusing on individuals' sustained competence throughout a long-term career. The construct extends the competence tradition that began with McClelland's [3] argument for testing competence rather than intelligence, and it differs from the employability literature, in which the capacity has been treated mainly as a set of attributes that help graduates obtain and hold a job [4][5][6][7].

Dynamic adaptive capacity is clearly distinguished from several related concepts (see Table 1). Occupational competence centres on job skills, with the implicit assumption that job requirements are relatively stable; employability focuses on job-seeking outcomes, and its scope of operation ends upon entry into the labour market; career adaptability emphasises attitudes and psychological readiness in the face of occupational role transitions and is essentially a psychological resource [8][9][10][11][13]; adaptive performance, meanwhile, describes individuals' work performance in changing situations and belongs to the category of outcomes. By contrast, dynamic adaptive capacity is characterised by the cyclical iteration of competence, emphasising the updating of competence as situations change, and covers the entire occupational process rather than a single moment of job seeking.

2.2 Structural Dimensions: A Five-Dimensional Progression

Drawing on existing research on adaptive expertise [15], learning transfer [16][17] and workplace learning [18], this paper structures

dynamic adaptive capacity into five dimensions: change perception, continuous learning, knowledge transfer, complex problem solving, and reflective innovation, which constitute a progressive and cyclical structure (see Figure 2).

Table 1. Differentiation Between Dynamic Adaptive Capacity and Related Concepts

Concept	Core focus	Time scale	Implicit assumption	Relationship with dynamic adaptive capacity
Occupational competence	Job knowledge and operational skills	Current job	Job requirements are relatively stable	Constitutes the foundational basis, but presupposes a static state
Employability	Knowledge and competencies for obtaining employment	Job-seeking stage	A single match is sufficient	Focuses on job-seeking outcomes and ends upon entry into employment
Career adaptability	Psychological resources for coping with role transitions	Occupational role transitions	Attitudes and psychological readiness	Provides a psychological foundation, with an emphasis on attitudes
Adaptive performance	Work performance in changing situations	Specific task situations	Outcome-oriented	Constitutes an outcome manifestation
Dynamic adaptive capacity	The capacity to relearn and apply in the midst of change	The entire occupational process	Continuous environmental change	The core construct of this study

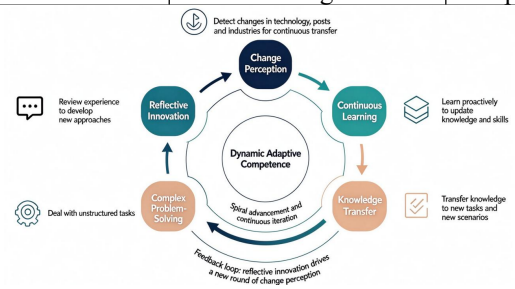


Figure 2. The Five-Dimensional Progressive Structure of Dynamic Adaptive Capacity of Vocational Undergraduate Talents

Change perception is the input starting point of the adaptation process, referring to individuals' capacity to become aware of, identify and assess technological iteration, job skill replacement and industrial policy adjustment. In the context of the Greater Bay Area, maintenance personnel for new energy vehicles need to perceive generational updates in battery and electronic control technologies, and software practitioners need to perceive the reshaping of development processes by large models; those who fail to perceive changes will accumulate competence gaps without realising it.

Continuous learning is the internalisation link of adaptation, referring to individuals' capacity to autonomously undertake learning around competence gaps and to update their stock of knowledge and skills. It requires learners to be able to set learning goals, monitor the learning process and evaluate learning outcomes, and to transform "needing to learn" into "being able to learn". Under conditions in which technological iteration continuously raises the competence threshold, continuous learning determines whether the speed at which the knowledge stock is updated can keep pace with external changes.

Knowledge transfer is the transformation bridge of adaptation, referring to individuals' capacity to transfer knowledge, skills and competencies acquired at institutions to new work tasks and situations, encompassing both near transfer in similar situations and far transfer in entirely new situations [16][17]. For example, accounting students transfer data analysis methods to business-finance integration scenarios, and mechatronics students transfer programmable control logic to the commissioning of equipment of new brands. Knowledge transfer enables learning outcomes to detach from the textbook context and enter real work scenarios, and is the key link through which learning outcomes are transformed into occupational competence.

Complex problem solving is the application output link of adaptation, referring to individuals' capacity to cope with unstructured, cross-domain complex tasks in industrial practice. Taking multi-factor fault diagnosis on intelligent production lines as an example, the causes of downtime may simultaneously involve mechanical, electrical, software and material factors, and there is no standard answer; practitioners need to classify hypotheses, seek verification from multiple sources, design comprehensively and implement collaboratively. This dimension directly tests the accumulated effectiveness of the first three dimensions.

Reflective innovation is the iterative sublimation link of adaptation, referring to individuals' capacity to review their own practice, distil

experience and generate new methods. Advanced manufacturing enterprises in the Greater Bay Area generally encourage frontline engineers to submit process optimisation proposals, which is precisely the organisational expression of reflective innovation. The outcomes of reflection drive the upgrading of cognitive frameworks and feed back into a new round of change perception, enabling the five dimensions to form a cyclical and iterative adaptation process. The connotations and typical behavioural manifestations of each dimension are shown in Table 2.

Table 2. Connotations and Behavioural Manifestations of the Five Dimensions of Dynamic Adaptive Capacity

Dimension	Connotation	Typical behavioural manifestations	Examples in the Greater Bay Area context
Change perception	Perceiving, identifying and assessing environmental changes	Tracking technological developments and identifying the replacement of job skills	Perceiving the iteration of battery and electronic control technologies
Continuous learning	Autonomously updating knowledge around competence gaps	Formulating learning plans, and monitoring and evaluating learning	Autonomously learning large-model development tools
Knowledge transfer	Transferring learning outcomes to new task situations	Near transfer and far transfer, and cross-contextual application	Transferring accounting methods to business-finance integration
Complex problem solving	Coping with unstructured, cross-domain complex tasks	Classifying hypotheses, seeking verification from multiple sources, and collaborative implementation	Multi-factor fault diagnosis on intelligent production lines
Reflective innovation	Reviewing practice and generating new methods	Summarising experience and proposing improvement plans	Submitting process optimisation proposals

2.3 Synergistic Relationships among the Dimensions

The five dimensions are not isolated from one another. Change perception and continuous learning ensure "input and updating", knowledge transfer and complex problem solving ensure "transformation and output", and reflective innovation ensures "iteration and sublimation". Among them, knowledge transfer has a dual identity: it is both an independent dimension and a cross-cutting capacity that connects the whole—every act of perception, learning and problem solving deposits transferable experience. It is precisely this progressive and cyclical structure that enables individuals to remain "continuously competent" rather than "competent once", and it also provides the analytical starting point for the formation mechanism discussed below.

3. The Formation Mechanism of Dynamic Adaptive Capacity

Dynamic adaptive capacity does not arise naturally; its formation depends on the combined effect of conditions at the three levels of the individual, the institution and industry.

3.1 The Individual Foundation Level

The individual is the primary agent of competence formation. Students with stronger career adaptability [10][11] engage in career exploration earlier and proactively collect industry information, thereby establishing change perception more quickly; students with stronger self-regulated learning ability are better at translating competence gaps into concrete learning actions (Zimmerman, 2002). The empirical study by Xu et al. (2024) shows that, among human capital, social capital and psychological capital, psychological capital has the most prominent effect on career adaptability, suggesting that individuals' beliefs, motivation and proactivity constitute the internal cause of competence formation. Although institutions cannot replace individual learning, they can help students form the self-monitoring habit of "competence gap—learning action" by moving career education earlier and offering career exploration courses, thereby amplifying the positive effect of the individual foundation.

3.2 The Institutional Cultivation Level

Institutional cultivation is the main front for competence formation, and its role is embodied in the three links of curriculum, practice and evaluation. In terms of curriculum and teaching, project-based, case-based and scenario-based teaching should replace one-way lecturing, so that students experience the complete process of "perception—problem solving—reflection"; in terms of practical training, students should be

enabled to practise transfer in near-authentic positions by relying on on-campus training bases and work-based learning, so that knowledge is activated through use; in terms of evaluation and feedback, the progression of competence should be observed through behavioural records, portfolio evidence, competition outcomes and growth profiles, and the trajectories of change across the five dimensions should be presented using radar charts and growth curves, avoiding the use of a single examination to measure dynamic adaptive capacity. It is worth noting that the intervention study by Wetstone and Rice (2023) showed that the cultivation of adaptability can hardly be achieved quickly through short-term programmes, which requires institutions to embed the relevant training in long-cycle cultivation plans rather than arranging it as an isolated activity.

3.3 The Industrial Scenario Level

Industrial scenarios constitute the "second classroom" for competence formation, the core of which lies in the workplace learning opportunities provided by industry–education integration and school–enterprise collaboration. Billett (2001) pointed out that the learning value of workplaces depends on the interaction between "the affordances provided by the setting" and "individual willingness to participate"; Fuller and Unwin's (2003) expansive learning environment framework provides criteria for judgement—only those environments that expose learners to knowledge beyond boundaries and offer multiple modes of participation can support far transfer. The Greater Bay Area has already developed relatively mature practices: vocational undergraduate institutions have jointly established industrial colleges with enterprises such as Huawei and BYD, building programme courses onto the industrial chain, extending teaching classrooms into industrial parks, and introducing authentic projects into practical training. Industrial participation enables students to come into contact with industry-level equipment and standards while still at institution, creating authentic task conditions for knowledge transfer and complex problem solving.

3.4 Synergy among the Three Levels

The three levels of the individual, the institution and industry constitute a synergistic mechanism of "individual agency—institutional provision—industrial empowerment" (see Figure 3): individuals provide the foundation of motivation and metacognition, institutions provide the carriers of curriculum and practical training, and industry provides authentic tasks and standard feedback. The three support one another, and without any one link, competence can hardly be genuinely established—without individual proactivity, cultivation cannot be internalised; without institutional provision, competence lacks systematic training; without industrial participation, training will ultimately become disconnected from reality.

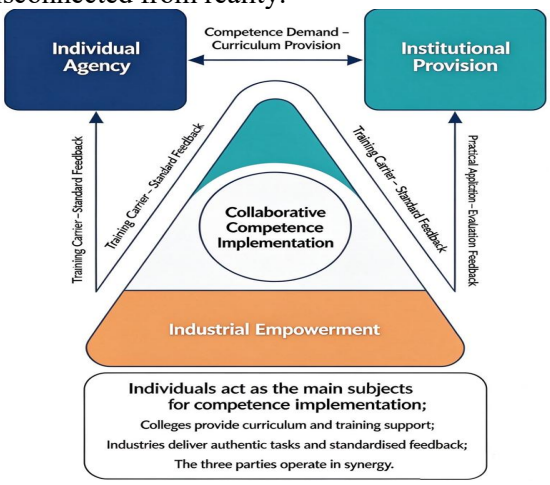


Figure 3. The Three-Level Synergistic Mechanism of the Formation of Dynamic Adaptive Capacity

4. Dynamic Adaptive Capacity-Oriented Cultivation Pathways

Translating the competency structure into cultivation practice requires the repositioning of cultivation objectives and the corresponding transformation of cultivation mechanisms. On the basis of the structure and mechanism set out above, this part proposes three pathways.

4.1 Reconstructing Cultivation Objectives Anchored in the Competency Structure

Traditional cultivation objectives are mostly based on lists of job responsibilities and can hardly cope with the continuous change of jobs. Cultivation objectives oriented to dynamic adaptive capacity should be anchored in the five dimensions: while retaining the necessary job skills, they should explicitly take change perception, continuous learning, knowledge transfer, complex problem solving and reflective innovation as the explicit objectives of cultivation, and decompose them into programme-specific cultivation plans and course

modules. This means that programme development can no longer remain at the level of "aligning with current jobs", but should shift to "aligning with change itself", driving the focus of cultivation to shift from "job-competent individuals" to "change-adaptable individuals".

4.2 Building a Closed-Loop Improvement Mechanism for Cultivation

In response to the structural mismatch between industrial change and talent cultivation, this paper proposes a closed-loop mechanism of "industrial demand identification—job task analysis—competency structure determination—cultivation implementation—evaluation feedback" (see Figure 4). The industrial demand identification link continuously tracks industrial policies, occupational standards, recruitment information and technology roadmaps in the Greater Bay Area to form a dynamic demand list; the job task analysis link decomposes job descriptions into task units and identifies routine tasks and unstructured tasks within them; the competency structure determination link maps task requirements onto competency indicators across the five dimensions and clarifies the key dimensions for each programme; the cultivation implementation link reorganises cultivation elements according to "competence formation" rather than "disciplinary logic"; and the evaluation feedback link returns evaluation data to demand identification, driving the mechanism to self-correct.

4.3 Improving Tiered Evaluation and Feedback

Evaluation and feedback constitute the "dashboard" of the closed loop and determine whether the mechanism can self-correct. This paper proposes the construction of three tiers of evaluation: process-oriented competency evaluation, which adopts behavioural records, portfolio evidence, competition outcomes and growth profiles for tiered assessment, and visualises changes across the five dimensions using radar charts and growth curves; outcome-oriented employment evaluation, which tests cultivation effectiveness through employment match, programme–job relevance rate and employer satisfaction; and longitudinal development evaluation, which conducts follow-up surveys of graduates one year and three years after graduation to test the long-term effects of dynamic adaptive capacity on job mobility, salary growth and sustainable career development. Data from the three tiers of evaluation are fed into the feedback link, forming a continuous optimisation cycle of "evaluation—feedback—improvement—re-evaluation". It should be noted that the above pathways constitute a theoretical design, and their applicable conditions and implementation effects in specific programmes still await testing by subsequent research.

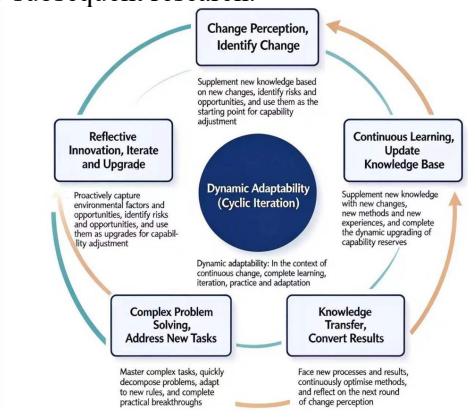


Figure 4. The Closed-Loop Cultivation Mechanism Oriented to Dynamic Adaptive Capacity

5. Conclusion

Focusing on the questions of "what to cultivate" and "how to cultivate" in vocational undergraduate education under conditions of continuous industrial change, this paper has conducted a theoretical exploration of the structure and formation mechanism of dynamic adaptive capacity, arriving at three understandings. First, the structural predicament of vocational undergraduate talent cultivation is rooted in the tension between a cultivation logic that takes static jobs as its reference and the continuous change of industry; the way to resolve it is not simply to accelerate the speed of curriculum updating, but to establish "adapting to change" itself as the cultivation objective, that is, to shift from cultivating "job-competent individuals" to cultivating "change-adaptable individuals". Second, dynamic adaptive capacity can be structured into five progressive dimensions: change perception, continuous learning, knowledge transfer, complex problem solving, and reflective innovation, the essence of which lies in dynamicity—competence is updated as the environment changes, rather than being a one-off stock. Third, the formation of this capacity depends on the three-level synergy of "individual agency—institutional provision—industrial empowerment", which no single actor

can accomplish independently; the design of cultivation pathways should maintain a continuous response to external industrial change through a closed-loop mechanism.

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References

[1] Guangdong Guangdong-Hong Kong-Macao Greater Bay Area Research Institute. (2025). 2025 Report on the Development of Innovation Capacity in the Greater Bay Area. Guangzhou: Guangdong Guangdong-Hong Kong-Macao Greater Bay Area Research Institute.

[2] MyCOS Research Institute. (2025). 2025 Employment Report of Chinese Higher Vocational College Graduates. Beijing: Social Sciences Academic Press.

[3] McClelland, D. C. (1973). Testing for competence rather than for "intelligence." American Psychologist, 28(1), 1–14.

[4] Knight, P. T., & Yorke, M. (2003). Assessment, learning and employability. Open University Press.

[5] Yorke, M., & Knight, P. T. (2006). Embedding employability into the curriculum (Learning and Employability Series One). Higher Education Academy.

[6] Tomlinson, M. (2008). "The degree is not enough": Students' perceptions of the role of higher education credentials for graduate work and employability. British Journal of Sociology of Education, 29(1), 49–61.

[7] Bao Wei, Wan Yihui. (2025). Theoretical construction of Chinese university students' employability from a pedagogical perspective. Chinese University Students' Employment, (1), 9–19.

[8] Savickas, M. L. (1997). Career adaptability: An integrative construct for life-span, life-space theory. The Career Development Quarterly, 45(3), 247–259.

[9] Savickas, M. L., & Porfeli, E. J. (2012). Career Adapt-Abilities Scale: Construction, reliability, and measurement equivalence across 13 countries. Journal of Vocational Behavior, 80(3), 661–673.

[10] Rudolph, C. W., Lavigne, K. N., & Zacher, H. (2017). Career adaptability: A meta-analysis of relationships with measures of adaptivity, adapting responses, and adaptation results. Journal of Vocational Behavior, 98, 17–42.

[11] Guan, Y., Deng, H., Sun, J., Wang, Y., Cai, Z., Ye, L., Fu, R., Wang, Y., Zhang, S., & Li, Y. (2013). Career adaptability, job search self-efficacy and outcomes: A three-wave investigation among Chinese university graduates. Journal of Vocational Behavior, 83(3), 561–570.

[12] Xu, Q., Hou, Z., Zhang, C., Cui, Y., & Hu, X. (2024). Influences of human, social, and psychological capital on career adaptability: Net and configuration effects. Current Psychology, 43(23), 2104–2113.

[13] Oliveira, Í. M., & Marques, C. (2024). The role of career adaptability and academic engagement in college student's life satisfaction. International Journal of Environmental Research and Public Health, 21(5), 596. https://doi.org/10.3390/ijerph21050596

[14] Wetstone, H., & Rice, K. G. (2023). Enhancing career adaptability among university students: An intervention study. Journal of Career Development, 50(6). https://doi.org/10.1177/08948453231187910

[15] Hatano, G., & Inagaki, K. (1986). Two courses of expertise. In H. Stevenson, H. Azuma, & K. Hakuta (Eds.), Child development and education in Japan (pp. 262–272). Freeman.

[16] Perkins, D. N., & Salomon, G. (1992).

Transfer of learning. In T. Husén & T. N. Postlethwaite (Eds.), International encyclopedia of education (2nd ed., Vol. 11, pp. 6452–6457). Pergamon.

[17] Barnett, R., & Ceci, S. J. (2002). When and where do we apply what we learn? A taxonomy for far transfer. Psychological Bulletin, 128(4), 612–637.

[18] Zhao Zhiqun. (2009). New Concepts of Learning in Vocational Education and Training. Beijing: Science Press.

[19] World Economic Forum. (2025). Future of jobs report 2025. https://www.weforum.org/publications/the-future-of-jobs-report-2025/

[20] OECD. (2019). OECD skills outlook 2019: Thriving in a digital world. OECD Publishing.

[21] Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. Theory Into Practice, 41(2), 64–70.

[22] Billett, S. (2001). Learning in the Workplace: Strategies for Effective Practice. Crows Nest: Allen & Unwin.

[23] Fuller, A., & Unwin, L. (2003). Learning as apprentices in the contemporary UK workplace: Creating and managing expansive and restrictive participation. Journal of Education and Work, 16(4), 407–426.