

University of Groningen

A Holistic Person-Centred Approach to Mobile Assisted Language Learning

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DOI:
[10.33612/diss.172696334](https://doi.org/10.33612/diss.172696334)

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
2021

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Peng, H. (2021). *A Holistic Person-Centred Approach to Mobile Assisted Language Learning*. University of Groningen. <https://doi.org/10.33612/diss.172696334>

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CHAPTER 7

General discussion and conclusion

In this dissertation, a person-centred approach to (informal) mobile language learning was presented and methods for carrying out MALL (IMLL to be specific) research framed by a person-centred lens were described and exemplified with a cross-sectional study and a longitudinal study respectively. In this general discussion, we first recapitulate the main findings of the empirical studies conducted, followed by a detailed discussion of these findings in light of the person-centred perspective and the related complex dynamic systems perspective on L2 learning and development. We then provide theoretical and methodological implications for researching complex (mobile) language learning phenomena, as well as pedagogical implications for developing and integrating learners' IMLL experiences. Finally, the limitations of the present research project are pointed out and avenues for further research are recommended.

7.1 A recapitulation of main findings

The current project consisted of three parts. The first part (Chapter 2) examined the effectiveness of mobile technologies in L2 learners' language learning in general. The second part (Chapters 3, 4, 5) focused on learners' informal participation in mobile-assisted language learning activities. Specifically, a cross-sectional study and a longitudinal study were separately conducted, allowing for a better understanding of the experiential and developmental affordances of mobile technologies for learners' informal language learning. The third part (Chapter 6) concerned the design and integration of learners' self-initiated learning in informal contexts into L2 classroom agenda. Ultimately, the objective of this project has been to examine the inter-relationships between mobile technologies, the agentic learner, and language learning and development.

7.1.1 Effectiveness of mobile technologies in facilitating L2 learning

One purpose of this dissertation has been to examine the overall effect of mobile technologies on the learning of L2 communicative skills. To this end, a meta-synthesis (Chapter 2) was conducted, which empirically confirmed that pedagogy supported by mobile technology can be effective in enhancing second language learning relative to pedagogy implemented in more traditional ways. Specifically, our results revealed a large effect size ($d = .94$) for mobile technology applications on language learning overall, and a medium to large effect on the four global language skills (i.e., listening, reading, speaking, and writing) respectively. Further, the effectiveness of mobile technologies in language learning was found subject to the influence of variables such as duration of treatment, modality of delivery, and type of activities. That is, short-term interventions (within 4 weeks) produce larger learning effects than longer interventions (including 4–8 weeks and above 8 weeks), and pedagogy with multiple media components seems to be less effective than that with a single or dual medium support. Additionally, a larger effect was found for individualized mobile learning practices than collaborative ones.

7.1.2 Informal language learning with mobile technologies

As, in today's technologized era, the learning opportunities that mobile technologies afford in informal, out-of-class contexts are numerous and diversified (Reinhardt & Thorne, 2019), the second goal of this dissertation has been to examine the experiential and developmental affordances of the informal mobile language learning (IMLL) learners engaged in outside the classroom. We believe that a better understanding of the learner-initiated mobile language learning in informal contexts is vital if we are to make the best use of mobile technologies in language learning, to understand the contribution of the language contact in learners' daily lifeworlds to language learning and development, and to advise learners, as well as teachers, regarding the integration of learners' IMLL practice in L2 learning agenda.

After providing a theoretical and methodological frame for researching (informal) mobile language learning in Chapter 3, we carried out a cross-sectional study and a longitudinal study respectively, which lent credence to the experiential and developmental affordances of learners' IMLL practice. More specifically, Chapter 4 examined L2 learners' self-initiated IMLL experiences, which are often characterized as ubiquitous, contextualized, multifarious, and specific to the individual (Godwin-Jones, 2019; Kusyk, 2017; Sockett & Toffoli, 2020). By adopting a cluster analysis (as a person-centred method), we identified different types of learners who were distinctly different in terms of their IMLL experiences. There is, for example, one learner type that barely

spent time on English learning outside the classroom. Other types of learners tended to allocate a comparably large amount of time to performing reading-, listening-, writing-, speaking-, and language feature-related IMLL activities. Still other types of learners were likely to engage in comprehension-based (e.g., listening and reading) IMLL activities, falling short of English use for communication.

We also established *multivariate* profiles of the learner types identified, using a set of motivational, emotional, and linguistic variables that jointly shaped learners' IMLL. The establishment of different learner types characterized by distinct behavioural, motivational, emotional, and linguistic configurations can help language teachers better understand the language exposure outside the classroom and provide effective feedback and scaffolding tailored to each learner type. It should be noted that the multivariate IMLL learner profiles established in Chapter 4 were based on data collected at one time point, so the learner profiles established might fluctuate over time (see also Kusyk, 2017).

In Chapter 5, we continued the exploration of L2 learners' IMLL practice, but attended to learners' language development through informally participating in varied mobile learning activities outside the classroom over time. Linguistic complexity was employed in the study "as a valid descriptor of L2 performance, as an indicator of proficiency, and [especially] as an index of language development and process" (Verspoor et al., 2017, p. 1), which assessed the complexity of learners' written production along both syntactic and lexical dimensions. Specifically, by applying a time-series clustering technique (also as a person-centred method), we first depicted individual-level developmental processes that are often characterized as idiographic or even individually owned, and then identified the developmental patterns that transcended individual variety and heterogeneity. The developmental patterns identified reveal that IMLL learners can become developmentally more advanced in the area of both lexis and syntax, mastering syntactically and lexically more complex language use in their written production. This pattern identification in bottom-up manner may serve as ecologically valid ways to generalize from the individual to a wider population, helping research on informal language learning transcend "the *that's interesting* stage" (Gass, 2006, p. 213, emphasis in original) and arrive at "findings that are interpretable with some degree of confidence within the [specific] setting" (Byrnes, 2020, p. 242).

7.1.3 Learner engagement in digital storytelling tasks

While the cross-sectional study (Chapter 4) and the longitudinal study (Chapter 5) have shown the experiential and developmental benefits of learners' informal participation in mobile learning

activities, one of the stances this dissertation takes has been to go beyond learner engagement in IMLL practice. Rather, efforts should also be devoted to the design and integration of learners' IMLL experiences in L2 classroom agenda, using "an adaptive pedagogy that would situate language and culture as lived practice" (Dubreil & Thorne, 2017, p. 6). Digital storytelling (DS) is increasingly recognized as one such pedagogically structured design (Reinders, 2011; Sauro et al., 2020; Sauro & Thorne, 2020). Previous DS studies have confirmed the effectiveness of DS in supporting L2 learning (see, e.g., Hava, 2019; Sauro et al., 2020). In Chapter 6, we further examined whether and to what extent learners were authentically and intrinsically engaged in their iterative performance of a digital storytelling task.

Informed by Philp and Duchesne's (2016) multidimensional framework of learner engagement, this longitudinal case study (see Chapter 6) closely examined how two Chinese EFL learners engaged in a series of fanfiction (a specific form of DS) tasks along behavioural, cognitive, social, and affective dimensions. We also tracked the ensuing changes in the two learners' writing over 10 months. Results show that the two learners engaged differently in the fanfiction task, and that the same learner exhibited differentiated on-task engagement when iteratively performing the task. It was also found that the two learners followed divergent developmental paths in terms of writing complexity. We further offered pedagogical suggestions that accommodate this variation across learners and within the same learner over time to better design and implement DS tasks.

7.2 Variable-centred approach vs. person-centred approach

One focus of this dissertation has been methodological issues regarding researching informal language learning and development with mobile technology. A necessary prerequisite for the choice of appropriate analytic methods is a strong link between the methodology applied and the features and structures of the problem focused on (MacIntyre et al., 2017; see also Bergman et al., 2003). That is, to reach the scientific goal of empirical research, the choice of the appropriate and effective methodology in each specific case must (a) be based on careful and integrative consideration of the phenomena under investigation, and (b) be made with reference to an appropriate theoretical framework for the phenomena.

Previously when carrying out L2 research and MALL research, the variable has been considered the main conceptual and analytical unit. That is, theories and statistical analyses often take the variable as a central concept. Results are then interpreted in terms of a mapping of the observed relations to the expected relations among the hypothetic constructs/variables as indicated by the theory concerned. This variable-centred approach was taken in most traditional L2 studies,

which basically draw on a random sample of learners from a presumably homogeneous population, examine the effects of one variable on another in the sample selected, and generalize the results obtained at the sample level to the whole population. When applying the variable-centred approach, data are typically collected from many subjects (i.e., often with a minimum sample size of 30) at one or a few points in time. Consequently, this analytic approach to L2 data describes the characteristics of language learning and development at the sample (or the group) level, with a general set of parameters that is often easy to interpret (Howard & Hoffman, 2017).

However, from a complex dynamic systems (CDS) perspective (e.g., de Bot et al., 2007; Larsen-Freeman & Cameron, 2008), taking the variable-centred approach to examining language learning and development has limitations, as elaborated in Chapter 3 and illustrated in Chapters 4 and 5. That is, the modelling and description of variables at the group/sample level can be difficult to translate into the understanding of a single individual's developmental process due to the ergodicity problem (Lowie & Verspoor, 2019; see also our Introduction). According to the ergodic principle, if we are to generalize the findings concerning inter-individual variation (i.e., at the group level) to intra-individual changes over time (i.e., at the level of the individual), and vice versa, two strict conditions must be met. First, the developmental process has to remain *stable in time*, namely, having constant means and variability, no cycles and temporal dependencies. Second, the developmental process has to be *homogeneous across individual learners*. That is, each individual in the population has to follow exactly the same model and description (e.g., with same statistic parameters). As the process of language development tends to be non-stationary (i.e., violating the *homogeneity in time* condition), or heterogeneous across individuals (i.e., violating the *homogeneity across individuals* condition), or both, the developmental processes of individuals are highly likely to be non-ergodic. This means that there is no lawful relation between the structures of inter-individual variation at the group level and the structures of intra-individual variation at the level of individuals who compose the group (see a detailed discussion in Lowie & Verspoor, 2019).

The variable-centred approach is even more limited in today's technologized world where L2 learners have access to myriad technological learning resources and materials that articulate with their personal goals and motivation, learning interests and preferences, prior knowledge, language and digital competencies. As a result, their engagement in (informal) mobile learning activities can take a variety of forms and is essentially specific to the individual, which Kukulska-Hulme (2016) recognizes as a process of personalization. Although the variable-centred approach is highly useful in identifying important factors (e.g., motivation, learning belief, and use of learning strategies) that contribute to successful L2 learning, the (quantitative) examination at the group level obscures

learner diversity and heterogeneity and can thus overshadow the learning processes that are often unique to each individual (Godwin-Jones, 2019; Lowie & Verspoor, 2019). Additionally, the dynamic nature of these contributing factors (e.g., motivation, learning belief, and learning strategies) is also increasingly recognized (de Bot et al., 2007; Larsen-Freeman & Cameron, 2008), which further problematizes research methodologies that take variables as conceptual and analytic units. We would like to stress here that we are not denying the utility of the variable-centred approach; rather, it should be complemented by a person-centred approach that attends to individual learning processes which involve an intricate interplay of learner attributes (e.g., aptitude, motivation, and emotion) with the spatial-temporal contexts of learning activity (Benson, 2019; Larsen-Freeman, 2018).

Chapter 3 laid out the detailed rationale behind our choice of a person-centred approach to (informal) mobile language learning. In the following section we will demonstrate how the person-centred approach can shed important light on the complex, diverse, idiographic, and/or common features of learners' informal mobile language learning.

7.3 A person-centred account of informal mobile language learning

The current project proposed to research the complex IMLL phenomenon from a person-centredness perspective. In light of the person-centred approach (see Chapter 3), the processes of learners' language learning and development are by definition idiosyncratic (i.e., specific to the individual), and must be studied at the individual level. This said, it does not mean we should abstain from searching for general regularities. Rather, the search for regularities should start at the level of the individual (i.e., understanding individually unique model or set of parameters for with reliability and validity), aggregate similar models/parameters in a bottom-up manner, and then generalize these shared models/parameters across individuals to a larger group (Molenaar, 2016). Ultimately, the person-centred approach endeavours to uncover the underlying mechanisms of individuals' processes of change and development.

Fundamentally, our search for an ecological generalization across individuals arises out of a growing recognition that individuals (IMLL learners in our case) do not learn and develop another language in an identical way, and that, despite the individual variety and heterogeneity, salient patterns with regard to language learning and development still exist and can emerge from the data under examination (Baba & Nitta, 2014; Bulté & Housen, 2020b; Caspi, 2010). This is also reflected in the four basic tenets of the person-centred framework we presented in Chapter 3: (1) The process is partly specific to individuals; (2) The process is complex and is conceptualized as

involving many factors that interact at various levels which may be mutually related in a complicated manner; (3) There is a meaningful coherence and structure (a) in individual growth and (b) in differences between individuals' process characteristics; (4) Processes occur in a lawful way within structures that are organized and function as patterns of operating factors, where each factor derives its meaning from its relations to the others. Although there is, theoretically, an infinite variety of differences with regard to process characteristics and observed states at a detailed level, at a more global level there will often be a small number of more frequently observed patterns (see also Bergman & Magnusson, 1997).

As such, the question for L2 research (as well as MALL research) that logically follows is *In what respects and how are individuals similar, and in what respects and how are they different in terms of their learning experiences and language development?* An adequate answer to this question is a necessity for ecologically valid generalizations about principles and mechanisms underlying and guiding individual development (language development included). In section 7.3.1, we will elaborate on our responses to this question with two empirical studies (one cross-sectional and one longitudinal) we conducted.

7.3.1 Interindividual differences from a person-centred perspective

7.3.1.1 *Interindividual differences in the organization of operating components*

The person-centred approach views each individual as a functioning whole, with interwoven components jointly shaping individuals' learning experiences. Components here refer to, for example, learning behaviours, learner motivation and emotion, and spatial-temporal contexts. This approach enables us to identify and classify learners with shared patterns of learning experiences in a bottom-up manner, and interpret each learning pattern in relation to learner-internal and -external attributes and resources.

In our examination of learners' informal learning experiences with mobile technology (Chapter 4), we identified six types of learners who were distinctly different in terms of their IMLL experiences in a bottom-up manner. There is, for example, one learner type that barely spent time on English learning outside the classroom. Other types of learners tended to allocate a comparably large amount of time to performing reading-, listening-, writing-, speaking-, and language feature-related IMLL activities. Still other types of learners were likely to engage in comprehension-based (e.g., listening and reading) IMLL activities, falling short of English use for communication.

The identification of different learner types (each type composed of learners with similar IMLL experiences) allows us to gain a better understanding of how learners differently engage in varied

mobile learning activities on their own outside the classroom. For one thing, by taking a person-centred approach, the study (Chapter 4) shed light on learning patterns that were overshadowed by the learner variety and heterogeneity evident in IMLL: different learners with different learning interests and goals interact with a diverse set of devices and resources in multiple ways (Kusyk, 2017). That is, identifying the typically occurring IMLL patterns could lead to a more predictable manifestation of individual variety, and reveal hidden groups of learners who share similar IMLL patterns. In other words, by classifying individuals with shared learning patterns into groups, distinct homogeneous groups can be identified and a careful generalization of individual cases can be made. For another, as the different learner types had meaningfully distinct IMLL patterns, combining them would also produce a poorly defined “one-size-fits-all” scenario for language learning and teaching.

Uncovering the relatively homogeneous learner groups that emerge from the data also allows us to conduct L2 research in a more ecologically valid manner. Conventional research on L2 learning is often based on group studies with the assumption that results obtained at the group level can be generalized to the individuals composing the group. The validity of those precategorized groups is increasingly challenged, as L2 researchers (Godwin-Jones, 2019; Lowie & Verspoor, 2019) gradually recognize that individuals comprising *a priori* categories, such as gender, age, or language proficiency, are remarkably heterogeneous in other learner attributes such as motivation, emotion, preferred way of learning. As such, we recommend to complement the traditional group-level analysis of experimental data with a clustering procedure. That is, before implementing an intervention or a treatment, researchers could issue a series of pre-tests and questionnaires to collect data on individual differences and use clustering techniques to ascertain the existence of different, yet meaningful, learner types. Researchers could then examine possible interaction effects between different learner types and the intervention, which could provide valuable findings for the design of more effective learning materials, tools, and tasks.

7.3.1.2 *Interindividual differences in intraindividual changes*

Developmental processes are inherently about the changes that occur over time in response to internal and external stimulation at the individual level (e.g., Verspoor et al., 2011; Lowie & Verspoor, 2015). Literature has also documented that it is of crucial importance that the methods used for studying development phenomena have an affinity to the time-dependent process of variation and change of the variable under study (e.g., Lowie, 2017; Murakami, 2020). In line with this, our examination of learners’ language development through IMLL participation (Chapter 5)

adopted a longitudinal design which can shed light on the complexity and dynamism inherent in informal mobile language learning. That is, in the IMLL context, L2 learners typically use a variety of resources whose type, availability, and usefulness are likely to evolve. These publicly available and constantly expanding learning resources may not be uniformly noticed or taken advantage of by learners. Rather, different learners variably interact with the multifarious semiotic resources, which results in potentially divergent developmental processes where the ‘same’ input may be acted upon in different ways that are contingent upon the learner’s immediate needs and goals (Godwin-Jones, 2019; Sockett & Toffoli, 2020).

Unpacking the complexity and dynamism in IMLL, *i.e.*, identifying typical developmental patterns at a higher and macro level (Baba & Nitta, 2014) can lead to findings that go beyond the individual level. The person-centred approach is particularly useful in this regard, examining and comparing individuals’ developmental processes, or in other words assessing the interindividual difference in learners’ intraindividual changes (e.g., Bergman & Magnusson, 1997; von Eye & Bergman, 2003). In light of the person-centred approach, comparing individuals’ developmental processes, and even making generalizations across individuals, should start with (1) estimating developmental characteristics (e.g., depicted with statistical parameters) at the individual level, and (2) then aggregating individuals that show qualitatively similar developmental characteristics.

Through a time-series clustering methodology (as a person-centred method), we managed to depict idiographic, individually owned developmental processes, and identify the developmental patterns that transcend the individual variety and heterogeneity (Chapter 5). The “salient patterns—or essential underlying mechanisms—associated with typical system outcomes” (Dörnyei, 2014, p. 89) identified were highly informative with regard to the question—*What is being learnt through the informal language learning practices of today?*—raised by Sockett and Toffoli (2020, p. 482) in their comprehensive overview of informal language learning.

The identification of typical developmental patterns through IMLL participation also shed important light on methodological possibilities of researching the complex IMLL phenomenon in a bottom-up manner. As we mentioned earlier, investigations into IMLL practices may not be capable of legitimately studying the impact of a specific learning practice/activity on a given group of learners over a given time period, due to the “impromptu, unscheduled, and unofficial” nature of informal language learning (Toffoli & Sockett, 2010, p. 19). A more feasible way, therefore, would be to first examine developmental trajectories at the individual level, and then to compare the developmental trajectories of different individuals and aggregate the individuals who share similar developmental patterns (Godwin-Jones, 2019).

The existence and emergence of typically occurring patterns also receive support from the complex dynamic systems theory (CDST) (see, de Bot et al., 2007; Larsen-Freeman & Cameron, 2008), because the patterns emerged can sometimes be recognized as an expression of attractor states from the CDST perspective (see Bergman et al., 2017). Attractor states represent higher-order patterns of equilibrium that a system evolves toward or approaches over time, as a result of dynamic collections of components' spontaneous self-organization and adaptive changes (Larsen-Freeman & Cameron, 2008). In other words, attractor states are generally thought to come about through interactions of the system's components (Banzhaf, 2009). An attractor state allows us to describe what a system is doing now and the state in which it has stabilized, and the outcome or pattern it has fallen into through self-organization and adaptive changes (Hiver & Al-Hoorie, 2020; see also Thelen & Bates, 2003). We will return to the specific mechanisms of self-organization and adaptive changes in the following section, as it is the underlying mechanisms that “produce a particular time signal or trajectory of change over time in the state space that is essential for understanding the causal complexities of system development or change” (Hiver & Al-Hoorie, 2020, p. 34).

7.3.2 An organized whole functioning in a dynamic adaptation process

An additional important aspect of the person-centred approach is that it recognizes individual development not only as idiographic (i.e., focusing on the individual rather than the group/aggregate) but also as holistic (i.e., focusing on the individual as an integrated totality consisting of interwoven components) and interactional (i.e., focusing on the individual in interaction with the spatial-temporal contexts). When applied to language learning and development, the person-centred approach understands the process of language learning and development as encompassing the development of multiple interrelated components, such as learner interests and goals, learner motivation and emotion, learning strategies and behaviours, as well as environmental factors. These components each obtain its role and meaning in relation to the interaction with other components. More precisely, “a certain element drives its significance, not from its structure, but from its functional role in the system of which it forms a part”, as noted in Magnusson and Mahiney (2001, p. 5). To conserve this totality of the information, designing and implementing empirical research with a person-centredness lens should strive for identifying the patterns of the constitutive components (Bergman et al., 2017).

A case in point is our exploration and establishment of *multivariate* IMLL profiles (Chapter 4). That is, by applying a cluster analysis (a person-centred method), we not only identified different

types of learners who were distinctly different in their engagement with their self-initiated IMLL activities, but also established *multivariate* learner profiles using a set of variables indicative of learners' behavioural, motivational, emotional, and linguistic characteristics that concurrently shaped their informal mobile language learning. This finding provides further credence for Lai and Zheng's (2018) observation that learners' selective use of mobile technologies in L2 learning was an outcome of the interaction between learner attributes (e.g., motivation, emotion), learners' perception of learning activities, and the learning context. In other words, different components (e.g., learner interests, goals, motivation, learning behaviour, and environmental factors) are interrelated in a dynamic manner and it is their interplay that gives rise to individuals' IMLL experiences.

The holistic idea inherent in the person-centred approach is in consonance with the ecological view that Levine (2020) proposes, which sees the learner, learner attributes, and technological resources in terms of their interconnectedness. It is thus warranted to explore underlying mechanisms of the intricate interaction between learner attributes (e.g., motivation, emotion, language proficiency) and learning resources (e.g., technological tools, resources, materials). Characteristic of the intricate interaction among components are self-organization and co-adaptation, two features widely acknowledged from the CDST perspective (de Bot et al., 2007; Larsen-Freeman & Cameron, 2008).

When a system adapts its internal structure or function in response to external circumstances independent from overt instruction or programming, this is a process called self-organization (Dekker et al., 2011). Co-adaptation refers to a process in which components of a system "constantly reorganize their internal working parts to adapt themselves to the problems posed by their surroundings [or by other components]" (Hiver & Al-Hoorie, 2020, p. 26). By self-organizing and adapting constantly over time, operating components of a system maximize the functioning of the integrated system, as a result of which new pattern in the system tends to emerge (Juarro, 1999). While the way in which operating components in a certain system interact tends to be diversified, the number of observable patterns of the integrated system shaped by the self-organization and co-adaptation of operating components is restricted. In other words, only a limited number of patterns are observably functional for each system and for the integrated totality, as evident in our identification of different learner types (Chapter 4) and typical developmental patterns (Chapter 5).

To sum up, the person-centred approach discussed in the current project views the individual learner as an integrated totality. It endeavours to understand the individual development based on

the identification of learning and development patterns of its operating components in a bottom-up manner. Further, by identifying homogenous groups of individuals who share similar patterns, it is possible to compare different learner groups identified, to infer, or even to generalize, to a population of similarly structured individuals. Taking this person-centred framework seriously has far-reaching implications for understanding and explaining the processes underlying individual development, and for suggesting ecological pedagogy.

7.4 Implications of a person-centred approach

7.4.1 Implications for L2 (development) research

Viewed from a person-centred perspective, each individual functions as a whole system in which different components work together and adjust to each other to achieve a *good* functioning of the integrated system. Applying this approach to research on language learning and development, we as researchers should integratively consider learners' cognitive, motivational and affective engagement in language learning (Philp & Duchesne, 2016), as well as their interaction with spatial-temporal contexts (e.g., technological resources and materials in the current project) (Godwin-Jones, 2019). As the factors at play and the way in which they interact are often different for different individuals, the complex process of L2 development at different levels can take a variety of forms (van Geert, 2019) and be characterized as partly specific to each individual (Chan et al., 2015; Lowie & Verspoor, 2019). As such, we propose to put the individual at the core in MALL research (Godwin-Jones, 2019), and in L2 research in general (Benson, 2019; Newman, 2017). That is, research findings should be “interpretable at the level of the single individual and they should be informative of patterns of individual functioning” (Bergman & Lundh, 2015, p. 2).

Additionally, our search for different learner types (each type composed of learners with similar IMLL experiences) (Chapter 4) and typical developmental patterns (each pattern showing distinct developmental characteristics) (Chapter 5) also provides important insights. Prior variable-centred research viewed learners' IMLL experiences, their linguistic and educational background, motivation and emotion, as well as learning outcomes as separate variables, and examined the association and interaction between them (e.g., Lai & Zheng, 2018; Ma, 2017). Our findings, instead, suggest different relationships and interaction patterns among these variables. Therefore, the person-centred approach holds promise for adding to our understanding of intricate interactions among different components, such as learner attributes (e.g., motivation, emotion, learning behaviour) and spatial-temporal contexts (e.g., technological resources and materials), and allowing

insights not currently available from variable-centred research by giving information about how combinations of variables operate within individuals.

Taken together, the person-centred research paradigm advocated here is characterized by three foci: (1) *A focus on the individual*. Research findings should be informative at the individual level and for each learner's language learning and development. The variable/factor measured should be sufficiently reliable to make inferences about the "true state" of the individual (see also Bulté & Housen, 2020b). (2) *A focus on patterns*. The pattern or configuration of information about learner attributes (e.g., motivation, emotion, learning behaviour) should be the conceptual and analytic unit. (3) *A focus on the developmental process*. Intensive longitudinal data, which are also process-contingent, are often of great interest to the person-centred approach in which the dynamics of change and patterns of interaction are focused on (see Bergman & Lundh, 2015). Embracing the person-centred framework also has implications for how empirical studies are to be carried out. Normally, a well-designed explorative person-centred methodology aims to find one or a few typical (or observable) patterns that reasonably well summarize the data structure and functioning, while residue cases (i.e., outliers) are avoided to prevent them from distorting the organized structures and functioning.

Besides the theoretical implications, the adoption of a person-centred approach also provides methodological implications for L2 (development) research, by means of identifying learners' experiential and developmental patterns in a bottom-up manner. This type of pattern identification can extend the work of Lowie and Verspoor (2019), shedding important light on the ergodicity problem in L2 (development) research. According to the ergodic principle, group statistics cannot be generalized to the individual, and vice versa, unless two conditions are met: keeping stable in developmental processes and being homogeneous across individuals. In other words, *a priori* group should be homogeneous and the individuals composing the group must have the same developmental characteristics. By adopting a time-series clustering methodology (a person-centred method), our study (Chapter 5) found that the condition of being homogeneous across individuals was violated at the sample/group level. In fact, the differences in the parameters between individual cases was the reason why clusters (e.g., subgroups of individuals) were able to be identified through a clustering technique. In the clusters identified, components of each cluster have similar developmental patterns (depicted with similar statistic parameters); therefore, the clusters arguably satisfy the condition of being homogeneous. This improvement in ergodicity is important to generalizability. That is, although it may not be appropriate to generalize between an individual and the group as a whole, it is feasible to generalize between an individual and a cluster identified.

Our identification of typical developmental patterns (with a person-centred methodology) that hold for different individuals also provides added value for advancing our understanding of L2 developmental processes. In a critical appraisal of previous investigations into L2 (complexity) development, Bulté and Housen (2020a) noted that there is considerable variation within and across learners, which makes it difficult, if not impossible, to identify similarities or typical patterns between the developmental paths of the different learners, and to formulate hypotheses that are testable with different learners. In this project, we managed to identify typical developmental patterns that transcend individual-level developmental trajectories and hold for a majority of the individuals with a time-series clustering technique. This finding extends Bulté and Housen's (2020a) observation about learner variety and heterogeneity in terms of L2 developmental process, advancing our understanding of the principles and mechanisms of L2 learning and development.

Also arise from our examination of the developmental characteristics of (as well as developmental patterns in) written productions of IMLL learners are insights into the extent to which uptake from informal language exposure supports language learning (Chapter 5). We found that L2 learners exhibited a developmentally more complex repertoire of lexical and syntactic choices after 10-month-long informal participation in mobile learning activities outside the classroom, which allows us to extend Sockett and Kusyk's (2015) observation that learners, especially those of relatively advanced proficiency, often make little linguistic progress in informal contexts without any pedagogical infrastructure. Informal language learning has received relatively little research attention, compared with other language learning areas, possibly because it has been associated with so few positive learning outcomes. Our findings encourage further research on informal (mobile) language learning to be conducted. More broadly, learners in informal contexts have layers of contextual, cognitive, social specificities and these different layers should continue to be explored.

7.4.2 Implications for L2 pedagogy

As the language learner types (Chapter 4) and developmental patterns (Chapter 5) identified in the current project by employing a person-oriented approach pack information efficiently, they can help “significantly boost the interpretability of our research findings” (Byrnes, 2019, p. 526) and are therefore intuitively appealing for language pedagogy. An insightful example is our establishment of distinct behavioural, motivational, emotional, and linguistic profiles that are characteristic of different types of IMLL learners (Chapter 4).

With the knowledge produced by person-centred research, language teachers may be better placed to deal with the complex language learning phenomena in a cost-effective manner and provide effective feedback and scaffolding tailored to each learner type identified. For instance, to motivate the learners who barely engage in any IMLL on their own, teachers can incorporate existing mobile technologies (e.g., films, songs, social networking, digital games) into in-class instruction for a supplementary purpose (Reinders & Wattana, 2014). For the learners who mainly participate in comprehension-based IMLL activities, teachers can have students engage in an IMLL-integrated project (preferably production-driven) as mandatory. A nice example would be Sauro and Sundmark (2019), in which a fanfiction project was carried out as part of a mandatory course at a Swedish university. This course organizes students into groups of three to six to collaboratively write blog-based role-play fanfiction. In completing the required writing tasks, students can make use of the available mobile devices and resources. And for the learners already having equal practice in all language aspects on their own, teachers can keep an inventory of the mobile learning resources these students typically employ, together with their learning goals and interests, based on which teachers can help students construct their own IMLL programs (see also Lee, 2020).

Furthermore, a person-centred methodology can offer important practical tools for developing learning interventions and treatments, e.g., to investigate for whom and in what way interventions are beneficial (cf. Häätinen et al., 2009, 2013). As we suggested in Chapter 4, before implementing an intervention or a treatment, teachers could issue a series of pre-tests and questionnaires to collect data on learners' individual differences and use clustering techniques to ascertain the existence of different, yet meaningful, learner types. Teachers could then adapt the intervention or the treatment in accordance to different learner types, which could provide valuable findings for personalized instruction and design of more effective learning materials, tools, and tasks.

Findings of the current project regarding learners' IMLL experiences (Chapter 4) and the ensuing lexical and syntactic development (Chapter 5) also have social implications for L2 learning and development. Specifically, the project demonstrated the ubiquity and the long-term effect of engaging in informal learning activities with technology (e.g., watching captioned/subtitled TV series, movies and videos, listening to music and audio, and communicating with others via social networking), which hopefully contributes to a change of teachers', as well as learners', conception of L2 learning.

A related implication is that the present research evokes a reconsideration of the role of learners' language contact in their lifeworlds. Our findings that learners made improvements in the area of both lexis (in terms of lexical variability and lexical rarity) and syntax (in terms of sentential complexity) in Chapter 5 suggest that lexical and syntactic development can take place through learners' informal participation in mobile learning activities outside the classroom. As such, language teachers should encourage students to find ways to enhance the learning potential of the learning opportunities occurring in their everyday lives; meanwhile, teachers themselves should also find ways to incorporate students' informal language learning in L2 classroom agenda, using "an adaptive pedagogy that would situate language and culture as lived practice as a central organizing principle of foreign language study" (Dubreil & Thorne, 2017, p. 6). In the current project, digital storytelling was recognized as one such pedagogically structured design (Chapter 6).

Also shown in our designing and implementing digital storytelling tasks which integrate learners' IMLL experiences is that learners were not equally engaged in the digital storytelling tasks (Chapter 6). Conversely, the level of learners' on-task engagement seemed to be modulated by learners' personal interest, past experiences, affective enjoyment, and metacognitive sense of achievement, as well as their use of technological resources. This implies that merely designing and implementing digital storytelling tasks are not enough; rather, explicit instruction should also be provided about taking advantage of multifarious learning resources and materials available online and setting clear directions for improved task completion. As such, teachers need to consider and reflect on the factors carefully so as to decide the timing of explicit instruction.

7.5 Limitations of the study and avenues for further research

In spite of our endeavour to research mobile assisted language learning, especially in informal, out-of-class contexts, from a person-centred perspective, this research project is not without limitations.

The first limitation is to do with the sampling, particularly the sampling for the longitudinal investigation. The longitudinal study reported in Chapter 5 (data were also partly used in Chapter 6) examined only a small sample of college-level English learners in Southwest China. More studies on informal mobile language learning are needed to examine other participants in diverse linguistic, sociocultural and socio-political contexts, such as multilingual learning settings, online adult education programs, or other professional training programs. Future research may also want to look at learners of others languages (e.g., Japanese, Chinese) whose learning resources and materials were not commonly available in the digital wild.

Another limitation concerns methodological issues. The current project used cluster analysis as a specific person-centred method. There is, however, a wide range of analytic algorithms and models in line with the person-centred approach for describing, profiling, and classifying learning processes and outcomes. The choice should be made in a way that the method chosen matches the specific research problem of interest. For example, cluster analyses (or latent profile analyses) can be used to identify latent groups of learners in a sample/population based on a set of variables, and the relation between the latent groups identified can be analysed (Lee et al., 2019). Future research may also consider using other analytic methods such as latent transition analysis, which can help identify learner profiles at different points in time and examine an individual's movement between the profiles established at different time points (Lanza et al., 2013).

A related limitation is about the model we used to describe individuals' processes of change and development over time in Chapter 5. As we wanted to increase the parsimony (i.e., how transparent and simple are the results to meaningfully interpret) in modelling the intensive longitudinal data, we conducted a series of time-series analyses at the individual level. Other techniques such as state-space modelling, dynamic factor analysis, and p-technique factor analysis are needed to accurately, and, more importantly, adequately describe the individuals—modelling the idiosyncratic, within-subject, and time-lagged relationships of latent and/or measured variables (Chow et al., 2010; Ram et al., 2013).

Still another limitation relates to the measurement of some key constructs. For example, in the studies we conducted, data were collected with questionnaires, interviews, and learning journals, which are retrospective in nature. A more advanced method for collecting L2 learners' learning behaviours and experiences would be experience sampling method (ESM) (e.g., Conner et al., 2009) or ecological momentary assessment (Shiffman et al., 2008). Common to these advanced methods is that data are collected on individuals' behaviours and experiences in natural settings, close to the time when the individual had these experiences, and on repeated occasions. In this way, multiple snapshots of learners' learning behaviours and experiences can be obtained, which makes it possible to identify the changing and evolving patterns of learning behaviours and experiences *within* the individual.

It is also a limitation that, as the present research focused on the experiential and developmental patterns of learners who mainly engaged in informal mobile learning activities, it offered limited insights into why a particular experiential and developmental pattern came into being. The antecedents of these patterns could be a fruitful avenue for future exploration. In our study of IMLL experiences (Chapter 4), for example, we observed that the learners' different IMLL

experiences were related to their distinct motivational, emotional, and linguistic characteristics, as well as their use of multifarious technological resources. However, it is likely that other factors, such as learner aptitude, self-efficacy, and digital training, also play important roles in shaping IMLL learners' learning experiences and language development; therefore, these factors should be carefully considered in future IMLL research and MALL research in general.

7.6 Concluding remarks

In the present dissertation, we probed into L2 learners' mobile language learning, particularly in informal, out-of-class contexts. More specifically, we scrutinized the affordances of multifarious mobile technologies for L2 learning and development, examined how L2 learners configured the learning opportunities that mobile technologies afford in informal contexts and how their informal engagement in these learning opportunities contributed to their learning experiences and language development. Pedagogically structured designs that integrate these informal learning experiences into the L2 classroom agenda were also explored.

In this dissertation, we have advocated the usefulness of a person-centred approach in shedding light on the complexity, dynamism, and idiosyncrasy, as well as commonality, of L2 learners' informal language learning with mobile technology. It is also argued that a person-centred approach to informal mobile language learning may be able to overcome some limitations inherent in the variable-centred approach commonly adopted in traditional L2 research, by adding insights into the idiographic (i.e., specific to the individual), holistic (i.e., understanding the individual as a totality of the intricately interacting components), and interactional (i.e., viewing the individual in relation to its spatial-temporal contexts) features of the language learning phenomena concerned.

It must be noted that we emphasized from the beginning (see Chapter 3) that the variable-centred approach and the person-centred approach are complementary, not contradictory, in researching L2 learning and development phenomena. Both approaches are legitimate as long as they are applied with strict reference to the specific assumptions made in each of them. It is of relevance to reiterate in the end that it is the match between the problem and the method that is important (Bergman et al., 2003; Bergman & Vargha, 2013; Hilpert & Marchand, 2018; Lowie, 2017; MacIntyre et al., 2017). It would be highly productive to mix the person-centred approach and the variable-centred approach, rather than alternating between the two. Specifically, it is useful to apply variable-centred methods (e.g., by comparing means, computing correlations, and performing factor analysis) to obtain a provisory understanding of which factors are involved in the learning and development process. Based on this preliminary understanding, it might be

possible to construct reliable and valid scales measuring concepts and variables essential to the system under study. A person-centred methodology can then be employed to search for typical (developmental) patterns or configurations, which may lay the foundation for later formulating a nonlinear learning and development model in which important interactions are incorporated and explicated.

