Chapter 4
Employing a Framework to Examine the "Niche" for Mobile-Assisted Seamless Learning from an Ecological Perspective

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Abstract Despite the fast development of digital technologies and the booming of seamless learning pedagogical practices, mobile-assisted seamless learning generally happens only in specific and defined learning episodes leveraged by a uniform type of mobile devices. How school students use their own devices to support their seamless learning and what affordances of the mobile devices students would like to use for supporting their seamless learning have rarely been discussed and explored. This chapter, from an ecological perspective, discusses how seamless learning happens using the concepts of affordance network (functionally bound possibilities in an environment), effectivity sets (the attunement and employment of affordance network), and "niches" (sets of affordances or experiences), and develops a framework to examine the "niche" for seamless learning. Implications of the framework are explored. A seamless inquiry into understanding "anatomy of fish" is cited as an example to elaborate the framework.

Introduction

In the year 2006, Chan et al. envisage:

> Over the next 10 years, … We see that ready-to-hand access creates the potential for a new phase in the evolution of technology-enhanced learning (TEL), characterized by 'seamless learning spaces' and marked by continuity of the learning experience across different scenarios (or environments), and emerging from the availability of one device or more per student ("one-to-one") (p. 5).

Today, at the beginning of 2013, such educational practices are advancing toward this trend. Studies on seamless learning are booming (Wong and Looi 2011). The majority

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of these studies have focused on "mobile-assisted seamless learning," which refers to seamless learning mediated by 1:1 setting (Wong 2012; Wong and Looi 2011). In general, these mobile-assisted seamless learning studies have provided students with a uniform type of devices that serve as a standalone application with or without connection to a central desktop application (Chan et al. 2006; Pinkwart et al. 2003), for seamless personalized learning (Song et al. 2012), seamless inquiry-based learning (Toh et al. 2013), seamless language learning (Wong et al. 2012), exploring affordances of seamless mobile learning for enhancing students' lived experiences (So et al. 2008), and so on.

In the digital age, mobile technologies have become embedded and ubiquitous in students' lives, with increasing multimedia resources, supporting rich information exchange and social interactions, adding features, and converging technology applications (apps) into a mobile, wireless handheld environment. More and more students bring their own mobile devices wherever they go for their own needs like learning, personal management, communication, and fun across different platforms "just-in-time" and "just-in-place." These devices include iPhone, smartphone, iPad, Google Nexus, Tablet PC, and the like which generally run different operating systems such as iOS, Android, or Microsoft OS, and across different platforms. Nevertheless the learning platforms are more and more compatible with each other, which is conducive to mobile-assisted seamless learning.

Mobile-assisted seamless learning is categorized into ten dimensions by Wong and Looi (2011). Although one dimension concerns "combined use of multiple device types" (p. 2367), how school students use these devices to support their seamless learning and what affordances of the mobile devices students would like to use to support their seamless learning have rarely been discussed and explored. This chapter, from an ecological perspective, aims to develop a framework to examine the "niche" for seamless learning in order to understand how learning can be best supported with sets of affordances. A "Bringing Your Own Device (BYOD) for seamless science inquiry project" in a class of a primary school is cited as an example to elaborate the framework.

Literature

Seamless Learning from an Ecological Perspective – Distributed Cognition

Mobile technology educational applications have been predominantly curriculum-based, and learning is supported in intentionally designed environments rather than in everyday practice (Song 2011). However, learning does not happen only in specific and defined learning episodes. Seamless learning concerns the whole environment of seamless integration of learning experiences across formal and informal learning contexts, across individual and social learning, and across physical world and cyberspace (Wong and Looi 2011). What learners really do in the technology-rich environments

and how they coordinate their learning activities in the environment requires a theory tailored to understanding the interactions between learners and various resources in the environments. These resources include social resources such as people, and material resources such as information resources and technological resources (Palfreyman 2006). "Distributed cognition" deals with such issues (Hollan et al. 2000; Hutchins 1995). The theory, sharing ecological and social cultural perspectives, holds that learning takes place in context and recognizes the importance of the relationship between the learner and the resources in the environment in knowledge construction (Hollan et al. 2000; Hutchins 1995). The theory focuses on three kinds of distribution at least: (a) knowing may be distributed across the members of a social group; (b) knowing may involve coordination between internal (capability) and external (resources in the environmental) relations; and (c) knowing may be distributed through time in such a way that the products of earlier events can transform the nature of later events (Hollan et al. 2000, p. 176). This approach, different from the "fixed-eye vision" (Reed 1988, p. 282), takes the interaction of the learner and environment as the unit of analysis. According to Reed (1988), perceiving what we need, perceiving the values of things involves selecting and detecting the information specific to these things. What needs and intentions in the seamless learning environment learners perceive and what values of the mobile devices can be used to achieve the needs and intentions require an understanding of the relationship between the learner and resources in the environment, which involves the concept of affordances.

Affordances and Affordance Networks

According to Gibson (1977), affordances refer to "what it [the environment] offers the animal, what it provides or furnishes, either for good or ill" (p. 127), exist only "within the context of an animal–environment system" (Gibson 1979, p. 2), and are possibilities for action dynamically emerging in the environment (Normak et al. 2012). No matter whether an observer can perceive the affordances or not, they are there to be perceived. However, the same environment perceived by different observers may have different affordances. The environment is embedded with unlimited possibilities for action or affordances which make our life possible. The possibilities in the environment are bound functionally. These functionally bound possibilities extended in time that can be acted upon to realize particular goals are referred to as affordance networks (Barab and Roth 2006).

Effectivities and Effectivity Sets

Effectivities are complementary to affordances (Gibson 1979). Barab and Roth (2006) posit that "If an affordance is a possibility for action by an individual, an effectivity is the dynamic actualization of an affordance" (p. 6). Effectivities are related to the capabilities of the observers to act on the affordances of the resources in the environment

(Young et al. 2000). For example, a stool that affords sit-on-ability for an adult may not offer the same affordance for a small child. Only when the observer picks up information specific to the relevant properties of those things can one's intentions be realized (Reed 1988), and the affordances are seized and transformed into effectivities (Shaw and Turvey 1981). The attunements and behaviors that an individual can employ to realize the affordance network (functionally bound possibilities) are referred to as an effectivity set (Barab and Roth 2006).

Niches

The elements of affordance network and effectivity set are highly related to the creation of "niche" by an individual in an environment. The environment in which, from the perspective of an individual, "has optimal living conditions for performing actions related to their life" can be considered the "niche" of the individual (Normak et al. 2012, p. 264). This is different from the material world surrounding the person from the material aspects of one's mind (Barab and Roth 2006). Comparing an animal's "habitat" with its "niche", Gibson (1979, p. 128) assumes that a "habitat" is where it lives, whereas, its "niche" is how it lives, and suggests that "a niche is a set of affordances" for a particular individual; while, Barab and Roth (2006) further interpret the "niche" as a set of experiences. The contents of any "niche" are dependent on the individual's available affordance networks and effectivity sets in the environment (Barab and Roth 2006). The term "niche" has recently been used in the context of ecological learning systems (Normak et al. 2012; Song 2013; Pata 2009).

Framework of the "Niche" for Seamless Learning

As is mentioned in the previous section, one's "niche" is inseparable from affordance networks and effectivity sets, so is the "niche" for seamless learning. In the seamless learning environment, there exist various social resources such as teachers and peers, and material resources such as learning tasks, learning resources, mobile device tools, computer technologies and facilities, and so on. These learning resources provide many possibilities for the learners to take advantage of. These possibilities are connected with each other and will be expanded in the learning process to achieve certain learning goals. The expanded possibilities contribute to seamless learning affordance networks. Once learners perceive the affordance network, and make attunements to act on the network, then the affordance network will be realized and be transformed into an effectivity set. Thus, the "niche" for seamless learning is the results of interactions among the three inter-connected elements: the seamless learning environment, the affordance set, and the effectivity set (see Area A in Fig. 4.1). The "niche" for seamless learning cannot be achieved if an element is stripped off from these.

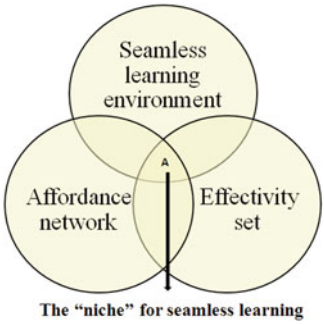

Fig. 4.1 Framework for examining the "niche" for seamless learning

Application of the Framework

In this section, we would like to show how the framework is applied to a research on science inquiry. We choose a topic on "the anatomy of fish" in a science learning unit of "Biodiversity" as an example to elaborate how to examine "the niche" for seamless inquiry.

Background of the Study

The science inquiry into understanding "the anatomy of fish" situates in a 1-year ongoing case study of the "Background of the Study on Bring Your Own Device (BYOD) for seamless science inquiry" in a class of Grade Six with 28 students in a primary school in Hong Kong. In the BYOD project, the students were encouraged to bring their own devices for science inquiry. Twenty-one students brought their own devices to school, ranging from iPad, iPhone, Smartphone, to mobile phones. Seven students did not have their own mobile devices, but the school lent iPad to these students so that they could benefit from the seamless inquiry. In addition, Edmodo – a free social network platform – was used for students to communicate, share information and work, submit assignments, and coordinate learning activities seamlessly. Evernote was used for students to record their learning journeys, make reflections, and share with peers. Skitch – a mobile app – was also recommended to the students for annotating images. Students were divided randomly into seven groups, each with four students. We choose one group's inquiry as an example to elaborate the "niche" for seamless learning framework. The group has four members with two boys and two girls under the pseudonyms of Ran (boy), Tin (boy), Ling (girl), and Nini (girl). Tin and Nini used their own iPad, Ling used her own smartphone, and Ran used iPad borrowed from the school.

Pedagogical Design of This Study

In the pedagogical design, an inquiry-based learning model was developed based on previous research (Hakkarainen 2003; Krajcik et al. 2000) to guide students' inquiry into "the anatomy of fish." The model consists of six elements, namely, (a) "engage"

in topics and problems of inquiry, (b) "explore" the information to address the problems, (c) "observe" the phenomena in the experiment, (d) "explain" the analyses and outcomes of inquiry, (e) "reflect" the processes and outcomes of inquiry, and (f) "share" the findings and reflections. The model was integrated into three learning activities carried out in a seamless learning environment across class, home, school lab, and online learning spaces (see Table 4.1). In the course of students' inquiry-based learning, the inquiry-based learning model was used as a scaffolding to guide the

Table 4.1 Science inquiry into understanding "the anatomy of fish" in a seamless learning environment

Seamless learning environment		Description
Learning activities and related inquiry skills	Activity 1 (out of school)	Engage: Access Hong Kong marine fish database online http://www.hk-fish.net/chi/database/feature/feature.htm
		Explore a few kinds of fish in the wet market, take photos, find out the names of the fish, and upload them to Edmodo. Students also share other information about fish on Edmodo
	Activity 2 (in school lab)	Observe (in school lab)
	Observe & explain	There are four kinds of fish prepared by the teacher for each group to observe. They need to observe and find out the scientific names of the fish and their anatomy. They are encouraged to make full use of their mobile devices in the observational process
		Explain (In school lab)
		Label the body parts of the fish using the mobile app Skitch to explain the anatomy of a fish and upload it to Evernote which is shared in Edmodo
	Activity 3 (online)	Reflect and share : Reflect on the following guided questions in Evernote and share in Edmodo:
	Reflect & share	Q1: Why are the four kinds of fish called fish?
		Q2: What have you learned?
Material resources: Mobile device tools	Embedded functions	Students can use the mobile devices to take photos, videos, or record audio files for their own learning needs
	Evernote	A suite of free software and services designed for note-taking and archiving (refer to http://en.wikipedia.org/wiki/Evernote for details)
	Skitch	A free app that helps one communicate visually with friends by annotating images, then save or share the annotation (refer to https://play.google.com/store/apps/details?id=com.evernote.skitch for details)
Social resources	Teachers	Teachers facilitated students' inquiry skills; recommend and encourage the students to perceive and use various affordances of mobile apps in their inquiry such as Evernote and Skitch, and the social network platform Edmodo; and identify the affordance networks for the inquiry
	Peers	Peers communicate, coordinate, discuss, share, and evaluate their products via Edmodo platform, and face-to-face (F2F) interactions by making use of the affordances networks

students' inquiry; in the meantime, the students were encouraged to perceive and act on the affordances of various tools and resources in the learning environment to obtain optimal conditions for learning, where the "niche" for seamless learning was identified.

The rest of this section elaborates how students perceived the affordances in the seamless learning environment, joined the affordance networks, and attuned their behaviors to actualize the affordance network through the three inquiry activities.

We first report the activities the students involved in the science inquiry followed by analysis of the "niche" for the group's seamless inquiry using the framework.

Examining the "Niche" for Inquiry into the "Anatomy of Fish" in Seamless Learning Activities

Activity 1: Engage and Explore (Out of Class)

In the first activity, to be engaged in the topic of inquiry and explore information to address inquiry problems of understanding the anatomy of fish, first the group members Ling and Tin used the mobile device as an information access tool to explore various websites about fish, and chose the information that they considered helpful for their inquiry, then used Edmodo as a sharing tool to share the chosen information so that the information could be distributed across the group members (see Figs. 4.2 and 4.3) using their mobile devices or computers at home. Secondly,

Fig. 4.2 Website about fish shared by Ling

Fig. 4.3 Website about fish shared by Tin

Fig. 4.4 Photo taken in a wet market shared by Ling

the group members Ling and Tin also went to the wet market and made use of the capturing (picture-taking) tool of their mobile devices to take a few pictures of different kinds of fish and shared them on Edmodo to help the group get a general understanding of fish. Figure 4.4 posted by Ling is an example of it. Thirdly, Ling also made use of the capturing (recording) tool of the mobile device to describe the kinds of fish the consumers bought observed by her in the wet market and upload the recording to Evernote – a note-taking tool which was shared on Edmodo.

In this activity, the learning goals were to explore information about "fish." The group members Ling and Tin had the capability to perceive the affordances of information access, capturing, sharing, and note-taking tools of the mobile devices. In addition, the teacher played a facilitating role of designing the learning activity to make the students stay focused on the learning goals. In addition, the teacher's recommendation of the Edmodo social platform and the Evernote app also increased the capability of the students to perceive and act on the affordance network to achieve their learning goals. This affordance network was employed by the group members to realize effectivity set and achieve their "niche" for seamless fish information exploring and sharing purposes. This "niche" or "set of experiences" for learning in this activity was obtained, and distributed to the next activity [see Fig. 4.9a Niche 1].

Activity 2 Observe and Explain (in School Lab)

In the lab, the four group members observed four kinds of fish prepared by the teacher, and each of them was responsible for finding out the scientific name of one kind of fish by joining and expanding the affordance network formed in activity 1. All group members were able to use an iPad or a smartphone as an information access tool to access the information about fish online on Edmodo (see Fig. 4.5),

Fig. 4.5 Mobile devices used by the group members

and use the mobile app Skitch as an annotating tool to label the body parts. Figure 4.6 shows that Ran was comparing the information recommended by his group member Tin on Edmodo about the fish online to the fish he was studying while labeling the anatomy of the fish using the mobile app Skitch.

In this activity, the group's learning goals were to observe and explain "the anatomy of fish" via an experiment. It was observed that the group members were more skillful in using the mobile device as an information access tool to obtain useful information about fish posted on Edmodo early while trying to identify the kind of fish on hand in the experiment. In the meantime, the students' affordance network established in activity 1 was expanded to include the annotation tool of Skitch recommended by the teacher to achieve their goals of presenting the names of the anatomy of fish. The expanded affordance network in the learning environment was employed by the group members to realize their effectivity set and achieve the goals of explaining "the anatomy of fish" in a visualized manner. This niche was further distributed to the next activity [see Fig. 4.9b Niche 2].

Activity 3 Reflect and Share

Succeeding the affordance network for learning from learning activity 2, the group members used Evernote as a note-taking tool to write their reflections and posted their labeled anatomy of fish to Evernote shown in Fig. 4.7a–d for sharing.

All the members wrote their reflections on Evernote except Nini. Tin reflected:

> Today, we did an inquiry into "fish". The teacher divided the four kinds of fish among our group members 1, 2, 3 and 4. I'm group member 1. The fish I studied is shown in the

Fig. 4.6 Tin – working on the fish

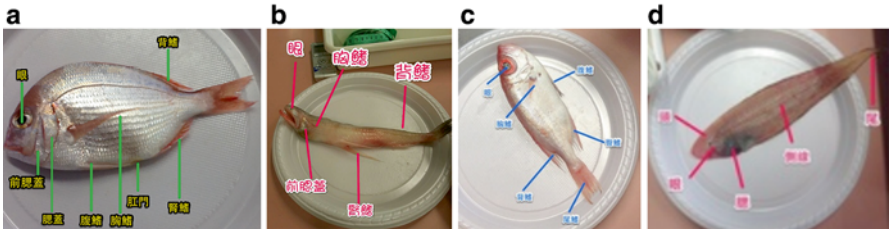

Fig. 4.7 Four kinds of fish labeled by Tin, Ling, Ran, and Nini (**a**) Fish by Tin, (**b**) Fish by Ling, (**c**) Fish by Ran, (**d**) Fish by Nini

above picture (see Fig. 4.7a). I divided the fish into several parts. They are: eye, pelvic fin, gill, spiny dorsal fin, pelvic fin, anal fin, etc. The fish I studied and the other fish my group members studied all belong to fish because all of them have gills, anal fins, fins and scales. Based on these, I know that they are fish. In addition, before the experiment, I thought that fish is hard if it is not cooked; after the experiment, I learned that what I thought was wrong. Fish meat is not hard at all, but soft and elastic. From the experiment, I learned a lot of knowledge about fish, for example: anatomy, features, quality of fish meat and scales. (Translated from Chinese)

Ran reflected that "I learned in Wednesday's experiment, different body parts of the fish, for example: lateral line, gill, pelvic fin, and spiny dorsal fin. The fish I studied is 'Golden Threadfin Bream'." Ling reflected that "All of them are fish because they use gills to breathe and use fins to move." But Nini did not make reflections. Facilitated by the teacher, "Great! Well done!! Can you find the name of this fish?" Nini found out the name and detailed information about the fish and posted it on Edmodo (see Fig. 4.8).

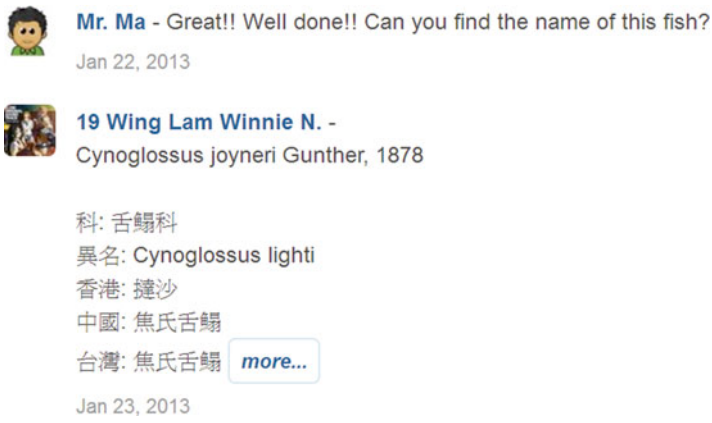

Fig. 4.8 Teacher's feedback and Nini's response

In this activity, the group's learning goals were to make reflections on "why the four kinds of fish are called fish" and what they learned after the experiment to deepen their learning about fish. The members made use of their sets of experiences gained from previous events/activities to reflect on what they learned using Evernote app as a note-taking tool. From their reflections, we note that all group members achieved their "niche" for the inquiry into the "anatomy of fish." The reflection shows that their learning was resulted from the perceived and used affordance network consisting of different tools on the mobile devices as well as the social resources such as peers' work and teacher's encouragement. As such, their learning was distributed across the group members, was relevant to their capability in perceiving and acting on the affordance network in the seamless learning environment, and was distributed chronologically through successive learning activities in such a way that the products (such as searched and shared resources) of earlier activities help transform learning later activities (such as the labeled fish anatomy, and deepened understanding of fish). In this process, their "niche" for inquiry into the "anatomy of fish" was achieved [see Fig. 4.9c Niche 3]. It is no denying that the inquiry-based learning model and the designed learning activities also provided affordances in the seamless learning environment to guide the students' inquiry, hence contributing to their science learning.

The group's evolving inquiry learning process across the three activities was presented graphically in Fig. 4.9a–c.

It is also noted that although the group members work toward the same learning goals, due to different members' capability of perceiving and acting on the affordances in the environment, their employed affordance networks were different. In Activity 1, Tin and Ling were more able to perceive and act on the affordances provided in the learning environment to realize their "niches" for information exploration; in Activity 2, Tin did the best in making use of the affordance network such as online resources about fish gained in the previous activity, and using Skitch to label the fish

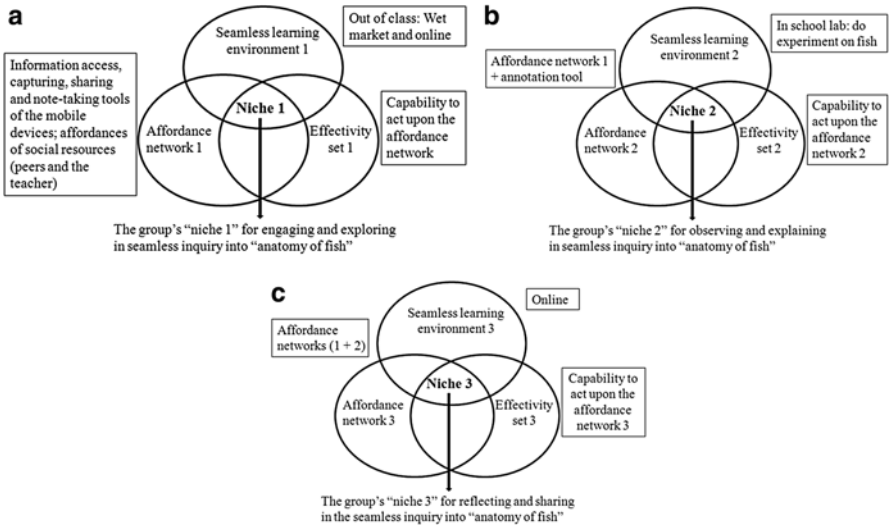

Fig. 4.9 (**a**, **b** and **c**) A series of niches for learning actualized in different activities

to archive his learning "niche" for understanding anatomy of fish, and Nini seemed to be the weakest; and in activity 3, Tin also made the best reflections among all members in the group based on the previous sets of experiences ("niches") and extended affordance networks. In the learning process, Tin could perceive more affordances of both social and material resources in the environment. These affordances extended and were seized by Tin to realize his "niche" for the seamless inquiry. Learning occurred because Tin identified the affordance networks that bore similar structures and even created new affordance networks in the successive and connected activities. In the whole learning process, the teacher's facilitation, recommendation of the apps, and learning activity design played an important role in increasing the students' capabilities to perceive and act on the affordances in the seamless learning environment. The other group members also achieved their "niches" for seamless inquiry into the anatomy of fish but with narrower perceived affordance networks than Tin's. This indicates that it is important to foster students' capabilities of perceiving and expanding the affordance networks to realize the "niches" for seamless learning.

Implications of the Framework

The concept of affordance network used in a seamless learning environment has four implications:

1. Affordances of various resources (material and social) in a seamless learning environment do not stand alone, but are functionally connected together to form affordance networks and are employed by learners to achieve certain goals.

For example, the affordance network of the inquiry-based learning environment leveraged by mobile technologies concerns not only the affordances of the mobile devices but also the affordances of the inquiry-based pedagogy, learning strategies, learning activities, teacher's facilitation, and peer interaction.

2. A learner's capabilities of perceiving and acting on the affordances of various resources in a seamless learning environment can be increased along with the employment of and attunements to functionally bound possibilities or affordance networks. McGrenere and Ho (2000), working in the context of software design, develop a two-dimensional framework in order to enhance the design that maximizes two dimensions (the degree of perceptual information and the degree of affordance) that are important for the perception and use of the affordances by a user as shown in Fig. 4.10. According to the framework, perceiving and acting on the affordances depends on two factors: the degree of perceptual information and the degree of affordance (McGrenere and Ho 2000). Increasing the two factors in the design will help increase the capability of the user to perceive and act on the affordances offered by the designed software. The same is true in perceiving and acting on the affordances in the seamless learning environment. For example, regarding the mobile technology affordances, nowadays more and more features and applications are built into the mobile device design to increase the affordances and perceptual information of the mobile device to the users so that their capability of perceiving and seizing the affordances can be increased. For example, SMS was originally developed for communication purposes between mobile holders. Later it was used for commercial purposes to make advertisements, and more recently has been increasingly used for educational purposes because more and more affordances have been perceived by learners and educators for enhancing language learning (Cavus and Ibrahim 2009; Song 2008), increasing awareness for collaborative activities (Liu et al. 2008), and so on. In another instance, mobile apps (applications) that are not designed especially for education are likely to tip into mainstream educational use that spans all of education across the world due to their low cost, ease of use, and fast delivery (Johnson et al. 2012).

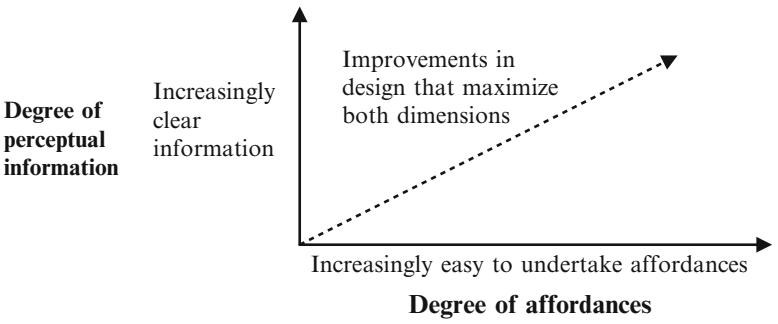

Fig. 4.10 Representing the affordance and the information that specifies the affordance (McGrenere and Ho 2000, p. 7)

In our example of a group's inquiry into the "anatomy of fish," the group members' capability was increased when they were increasingly involved in the inquiry-based learning activities because learning was distributed across time that the affordance network established in the earlier events was employed to transform the nature of later inquiry events (Hollan et al. 2000). In addition, the teacher's facilitation and peers' information sharing and exchange were also crucial for increasing capabilities of perceiving and acting on the affordances for "just-in-time" and "just-in-place" learning as learning was distributed across individual and social spaces. All in all, the affordances of both social and material resources in the seamless learning environment contributed to the affordance network for learners to perceive and act upon to achieve specific inquiry-based learning goals.

3. A learner's "niches" can evolve and transform learning across time. Due to different abilities and needs, the affordances in the seamless learning environment to be perceived and act on varied from learner to learner, hence result in different affordance networks, which in turn, result in different effectivity sets once they are employed to achieve certain learning goals. Therefore, the "niches" for seamless learning will also vary from learner to learner because of different affordance networks and effectivity sets. Just as Chemero (2003) posits, different individuals, with different abilities, may have "nonoverlapping niches" (p. 191) or sets of experiences. This implies that "the environment from an ecological viewpoint … is a complex set of relations among various affordances" (Shaw et al. 1982, p. 196). However, these "niches" for seamless learning do not stand alone. Seamless learning involves not just succeeding in one situation, but developing the capacity and interest to create new action possibilities, even reconstructing relations that might not have been readily apparent in the dynamic structure (Shaffer 2004, cited in Barab and Roth 2006). In addition, learning in this view is an ecological and social phenomenon that is distributed across time, individual and social, and internal and external spaces, which enables the learner to engage in progressively more adaptive individual–environment relations. As a learners' "niche" expands, it involves sets of experiences with increased effectivity sets and extended multiple affordance networks which evolve into new ways of individual–environment interactions (Barab and Roth 2006). Learning happens or transfer occurs when the learner becomes aware that different contexts, even with different contextual resources, have similar underlying affordances networks (Barab and Roth 2006).
4. This framework focuses on the interacting concepts of affordance networks, effectivity sets, and seamless learning environments grounded in ecological psychology and distributed theories. Using this framework to examine the "niche" for seamless learning suggests that learners should be provided optimal opportunities for exploring the affordances of the mobile devices and social resources in across different learning spaces. BYOD provides a technology model conducive to learners' explorations in an ecological learning environment supported by mobile technologies. However, we admit that the technology model BYOD alone could not be the full explanation for helping learners learn (Kobus et al. 2013). Rather, it is its combination with appropriate pedagogies that contributes to the learning process.

Conclusion

The chapter, from an ecological perspective, discusses how seamless learning happens using the concepts of affordance network (functionally bound possibilities in an environment), effectivity sets (the attunement and employment of affordance network), and "niches" (sets of experiences), and develops a framework of the "niche" for seamless learning. A seamless inquiry into understanding "anatomy of fish" supported by BYOD is cited as an example to elaborate the framework. Implications of the framework are explored. Employing the framework of the "niche" for seamless learning helps us understand how learners interact with the seamless learning environment and recognize that joining in the affordance network, expanding and even creating the affordance network is the key to realize effectivity sets and hence obtaining the "niche" for seamless learning.

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