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HOW DIGITAL KEYBOARD FEATURES SHAPE LEARNABILITY AND CONTINUATION: A THEMATIC ANALYSIS OF INTERVIEWS

Fusako Ishimura[1a], Meng-Cong Zheng [b]

[a] *Yamaha Corporation, Japan, fusako.ishimura@music.yamaha.com*
[b] *National Taipei University of Technology, Taiwan, zmcdesign@gmail.com*

ABSTRACT

Digital keyboards are often regarded as easy-to-start musical instruments because they are compact, affordable, and equipped with functions that support beginner-level learners. However, little is known about how beginner-level learners experience these instruments when beginning and continuing learning and how such experiences can inform interface and learning-support design. This study investigates how beginner-level learners perceive digital keyboard features and how these perceptions relate to their feelings and motivation to learn.

Semi-structured interviews were conducted with 13 learners enrolled in beginner-level digital keyboard classes in Taiwan, and the data were analyzed using thematic analysis. Through iterative coding, codebook development, and the construction of a conceptual model, we identified themes concerning ease of entry, learning barriers, support for continuation, and the relationships among these themes. The findings showed that digital keyboards were experienced as approachable because they enable learners to produce sound easily, practice without disturbing others, and access supportive features that lower the initial barrier to learning. Multifunctionality had a dual nature: it created difficulty and anxiety for beginner-level learners facing unfamiliar buttons, function names, and operations, while support functions, sound options, and accompaniment expanded learners' musical possibilities and helped them experience early success. The results further showed that continued learning was supported by digital keyboard features that enabled progressive achievement and enjoyment in practice, as well as by support from instructors, peers, and the learning community.

[1] Corresponding author. 10-1, Nakazawa-cho, Chuo-ku, Hamamatsu-shi, Shizuoka, 430-8650, Japan. fusako.ishimura@music.yamaha.com

Based on these findings, this study proposes a conceptual model of beginner digital keyboard learning in which learnability is shaped by the interaction among instrument characteristics, beginner learning experiences, and environmental, personal, and social support. This study contributes an empirically grounded conceptual understanding of beginner digital keyboard learning and suggests that beginner-oriented interface and learning-support design should make multifunctional features progressively accessible in ways that correspond to learners' developing confidence, skills, and musical goals.

Keywords: *Digital keyboard, Beginner learners, Thematic analysis, Interface design, Learnability*

1 INTRODUCTION

In Taiwan, several digital keyboard classes are offered. The learners of these digital keyboard classes are not only limited to children and students but also adult learners attending lifelong learning classes at community colleges or elderly people receiving services at the elderly service centers. This suggests that learners of digital keyboards are people of all age groups. Digital keyboards used for these lessons usually have a number of instrument sound presets, built-in songs, automatic accompaniment, lesson functions, and many other features enjoyable even for beginner-level learners. (Yamaha Corporation, 2024)

Many of these functions play an important role in supporting learners' performance and facilitating their learning experiences. However, the numerous buttons and controls needed to operate them may cause confusion and anxiety to the users. Complexity of the interface, such as the unclearness of the menu structure, control keys, and function names, may affect the perception of performance and easiness of use, as well as the difficulty to operate the instrument (Ziefle, 2002). Figure 1 shows the control panel of the Yamaha PSR-E283, the model used in the classes observed for this study, illustrating the number of buttons, the range of function categories (e.g., voice, style, song, and lesson controls), and the color-coded layout that beginner-level learners are required to navigate. Other classes attended by participants used comparable models, such as the Yamaha PSR-E383 and Casio digital keyboards, which offer a similar range of functions through different interface designs. This study originated from the awareness that the complexity and lack of clarity in operating multifunctional instruments may cause anxiety among beginner-level learners. The ultimate goal is to identify the factors that contribute to anxiety in beginner-level learners, eliminate them, and derive the necessary design requirements for digital keyboards that enable learners to study with reassurance.

Previous studies have addressed self-efficacy in music learners' motivation and engagement (Chen, 2024) and socio-economic status (McPherson et al., 2015), but few have investigated how specific digital keyboard features affect learners' emotions and motivation. This study examines beginner-level learners' perceptions of digital keyboard features through semi-structured interviews.

This study addressed two research questions：(1) What characteristics of digital keyboards do beginner-level learners perceive as making learning easier or more difficult? (2) How are these perceptions related to learners' motivation to begin and continue learning?



Figure1. Control panel of the Yamaha PSR-E283

2 METHOD

2.1 Participants

The participants of this study were 13 learners who enrolled in beginner-level digital keyboard classes in Taiwan. The sample included 11 women and 2 men. The distribution of ages among the participants was as follows: one in their 40s, five in their 50s, and seven aged 60 or older. As for keyboard experience, two had less than 6 months, three had between 6 months and less than 1 year, four had between 1 and less than 3 years, one had between 3 and less than 5 years, and three had more than 5 years of experience. It should be noted that for this study "beginner-level learner" was not determined by the duration of experience or skill, but as "a student attending a beginner-level digital keyboard class." Therefore, all participants were classified as "beginner-level learner." Based on observations of the classes, the beginner-level learners in this study ranged in skill from those who could play a melody with their right hand to those who could additionally use left-hand keyboard support functions (e.g., single-finger chord) to play chords and perform simple songs with accompaniment.

2.2 Interview Procedure

Semi-structured interviews were conducted with seven main questions relating to participants' perceptions of digital keyboards, differences from other instruments, impressions before and after starting to learn, changes in feelings and motivation to learn, and ideas about reassuring instruments for beginner-level learners. All the interviews were conducted in person and lasted approximately one hour, which included an introductory part explaining the study purpose.

Although the interviewer spoke Japanese, all the participants were Taiwanese who spoke Taiwanese Mandarin. Therefore, in order to conduct the interview, ChatGPT 5.2's voice feature was used to translate in real-time. In addition, an observer who understood both Japanese and Taiwanese Mandarin was present to help with the communication as needed.

2.3 Data Preparation

Final interview transcripts used for analysis were produced from the translation logs and compared to audio recordings. Missing or inaccurately translated content was corrected by verifying the audio data and context. Some speech-recognition errors were found, such as the traditional Chinese instrument "huqin" being translated as "flute," but none were judged to substantially affect the subsequent analysis.

2.4 Data Analysis

The interview data were analyzed through thematic analysis supported by iterative codebook development guided by the six-phase framework: familiarizing data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report (Braun & Clarke 2006). The purpose of the analysis was to identify patterns, based on the research questions.

First, the interview transcripts were read thoroughly to become familiar with the data. The researcher who conducted the actual interviews recalled the context and manner of the participants' discourse, noting patterns common to multiple participants as well as new insights. Next, the same researcher chose four interview datasets for the initial coding. These four were selected due to the difference in participant characteristics and narrative patterns, and contained relatively rich data. As a result of coding four interview transcripts, there emerged 248 code instances.

These code instances were then clustered as candidate theme categories and organized into a codebook for the analysis. The codebook included theme category names, definitions, related research questions, phases within the learning process, sub-themes, and representative script data. The codebook was developed to organize coded examples consistently, provide clear criteria for coding, and define differences between categories. This approach is consistent with methodological discussions that position codebooks as tools for documenting coding decisions, supporting reflexivity, and enhancing rigour in qualitative analysis (Oliveira, 2023).

The remaining nine interviews were then coded using and refining the codebook, resulting in a total of 365 coded segments across the dataset. These code instances were assigned to categories in accordance with the codebook, and it was verified whether the theme categories could cover the whole dataset. The theme categories in the codebook were then compared, integrated, and further interpreted to generate the final themes and conceptual model.

Finally, the conceptual model was developed to integrate the final themes and describe their interaction throughout the phases of beginner learning and continuation. The conceptual model was reviewed by two other researchers, and revisions were made to improve the clarity and coherence of the interpretation.

3 RESULTS

Six overarching themes emerged from the thematic analysis, capturing diverse learner experiences across different learning stages. These six themes are as follows: "Perceived Approachability and Ease of Getting Started," "Dual Nature of Multifunctionality," "Initial Anxiety in Early Learning," "Early Success Experiences Through Simple Playing and Support Functions," "Step-by-Step Achievement and Enjoyment in Continued Practice," and "Instructor, Peer, and Community Support Across Learning Phases."

3.1 Perceived Approachability and Ease of Getting Started

Before and during the initial stage of learning, many participants regarded the digital keyboards as accessible and easy-to-start instruments. Reasons cited included its compact size, affordable price, ease of producing sound, and ability to practice without disturbing others. One participant commented on the ease of practicing within their daily living space and the reassurance it offered to beginner-level learners, stating:

"I think the digital keyboard is an instrument beginners can use with reassurance, since you can turn the volume down, practice at home, and they're inexpensive." (P10)

Another participant explained that, compared to instruments that are physically demanding or require pitch adjustment, digital keyboards are easier to produce the correct pitch simply by pressing the keys.

"Since the notes are properly set from the start, unlike instruments such as the saxophone or guqin where you need to search for the right notes, I think the digital keyboard is easier for beginners to start and learn." (P02)

These comments indicate that digital keyboards were recognized as musical instruments that can easily be used in everyday life and that lower the psychological and practical barriers to producing sound and beginning practice.

3.2 Dual Nature of Multifunctionality

The multifunctionality of digital keyboards was perceived as a dual-sided characteristic. While the variety of functions made it difficult for learners to understand and operate them, it also served to support beginner-level learners' playing and expand their musical sensibilities. Several participants noted that it took time to fully understand and master all the functions. In addition, some participants appeared confused because they did not know which function would be activated when they pressed a button.

"There are so many functions. To understand and master all of them requires some time, and in some cases, quite a long time." (P02)

"The reason it's difficult is not knowing how to switch between functions—there are so many buttons, and I don't know what each one does." (P03)

On the other hand, many participants also pointed out that the installed features helped beginner-level learners with their performance. For instance, features like the one that displays the time signature of a rhythm in numeric form when setting the rhythm of a song and the one that estimates chords using a single finger without requiring multiple fingers help beginner-level learners play songs.

"Digital keyboards let you set rhythms like 4/4 or 3/4, and switch between multi-finger and single-finger chords. This makes it easy for beginners, since they don't need to use many fingers to play chords." (P02)

Multifunctionality also helped the musical capacity of the learners. Many participants found it exploratory and enjoyable to change the instrument sounds, rhythms, and accompaniment.

“Using these kinds of features is, of course, a lot of fun. It’s like I’m exploring, and any song can be arranged with different accompaniments and sounds.” (P14)

These narratives indicate that the meaning of the multifunctionality of digital keyboards varies depending on how learners use these functions. In cases where these features are presented as unfamiliar buttons, labels, or complex procedures, multifunctionality may cause confusion or difficulty. However, when learners see multifunctionality in the context of performance simplification, assistance, auto-accompaniment, or musical richness, then it becomes a resource that supports learners’ enjoyment and expands their possibilities.

3.3 Initial Anxiety in Early Learning

The initial anxiety that learners experience at the beginning of their studies manifests in two main ways. The first was anxiety stemming from not knowing how to operate the system when confronted with the complexity of its function. The second was a sense of anxiety, akin to disappointment, arising from being able to utilize only a portion of the many available functions. In the interviews, regarding the first type of anxiety, participants expressed concerns about not knowing what to do next and being unable to predict what would happen when pressing a button.

“There are various process, many buttons, rhythms, accompaniments, and function keys, and I still do not know how to use them.” (P03)

The second initial anxiety arose from learners feeling that they were unable to make full use of the many functions. Several participants attributed their limited use of the available features to personal factors, such as insufficient study or age.

“Digital keyboards have all sorts of features, but in the end, I only use the most basic ones, like the accompaniment function and a few sounds and styles. It is a disappointing that I’m not making full use of the other features, and I think that’s the part I find difficult.” (P08)

"I was anxious that I might not learn well because of my age, since I had never studied music theory before." (P02)

These narratives suggest that not only the ambiguity associated with the operation, but also the learners' realization that they had access to a certain subset of the features seemed to contribute to the feelings of anxiety. Some participants tended to associate their limited access with certain personal characteristics like age or musical ignorance.

3.4 Early Success Experiences Through Simple Playing and Support Functions

Early successes experienced shortly after beginning to learn played an important role in helping participants overcome the difficulties and anxieties that came with the learning process. Even without having to attain highly developed skills and functions, the participants were able to have fun and be happy with simple play or supportive functions on the instrument. One participant explained that even simple performances can bring joy and a sense of accomplishment.

“Even playing single notes is enjoyable, and by simply playing do-re-mi-fa-so, you can play simple songs or children’s songs. I think this gives a strong sense of achievement.” (P08)

In addition, another participant commented that the accompaniment feature makes even limited performances sound like a full piece of music. Further, another participant suggested that even learners without a musical background can obtain a feeling of satisfaction when gradually assembling and completing a song.

"If you choose a style like rock or waltz and press play, the accompaniment plays automatically—just by holding chords, various instruments accompany you." (P04)

“You can start with simple songs, gradually add chords, and make the piece richer and more complete. Even people without musical experience can easily feel that they have properly played one complete song.” (P11)

These accounts show that support functions helped transform simple performances into musically satisfying results, allowing beginner-level learners to experience early success before mastering advanced techniques.

3.5 Step-by-Step Achievement and Enjoyment in Continued Practice

Participants’ motivation to continue learning was supported by the accumulation of a sense of achievement in stages and enjoyment that emerged through continuous practice. Continuous learning is not about just gaining new skills immediately. On the contrary, motivation for learning was gained gradually, step by step, including increasing the number of songs they could play and incorporating the use of chords. For example, one of the participants stressed how, with a digital keyboard, it was very easy to understand your improvement, even when playing simple songs.

"When learning music, people want to feel their own growth. I think the digital keyboard makes it easy to feel results—even a simple song, once played to the end, gives a sense of accomplishment, and adding chords lets you feel your improvement." (P11)

In addition, they found enjoyment in using the digital keyboards’ features to add variations to the same songs. The same participant also commented on the following:

"Even with the same song, I think it is very interesting that the digital keyboard allows you to freely change the instrument voice and tempo, creating a completely different atmosphere each time. In this way, the range of expression expands." (P11)

These accounts suggest that consistent progress and variations in music made continued practice less monotonous, more enjoyable, and motivating to continue.

3.6 Instructor, Peer, and Community Support Across Learning Phases

The features of the digital keyboards were not the sole determinants that influenced continued learning; the environment surrounding the learners was also a significant factor. In the interviews, most participants expressed that it was helpful to have assistance from instructors and the presence of classmates in overcoming initial anxiety and motivating themselves keep on.

"At first, having a teacher's guidance is definitely necessary. Since you know nothing in the beginning, it's important to get tips from a teacher to overcome that initial hurdle." (P10)

Having peers who undergo similar difficulties also enables them not to take any difficulty personally because others are also experiencing it.

"It really puts my mind at ease to know that other students in the class were struggling with the same tricky sections. Knowing it wasn't just my problem, I felt reassured that I just needed to practice hard again." (P03)

From these stories, it is clear that learners received support from their instructors and peers in helping them continue the learning process through tangible tips and advice.

4 DISCUSSION

Based on the thematic analysis, a conceptual model was generated, which shows how perceptions of digital keyboard characteristics affect motivation through different phases of learning as follows: before learning, early learning, and continuation (Figure 2). This model comprises three levels of analysis—perceived instrument characteristics, beginner learning experiences, and environmental, personal, and social support—and shows that digital keyboard characteristics influence learners' emotions differently across phases of learning.

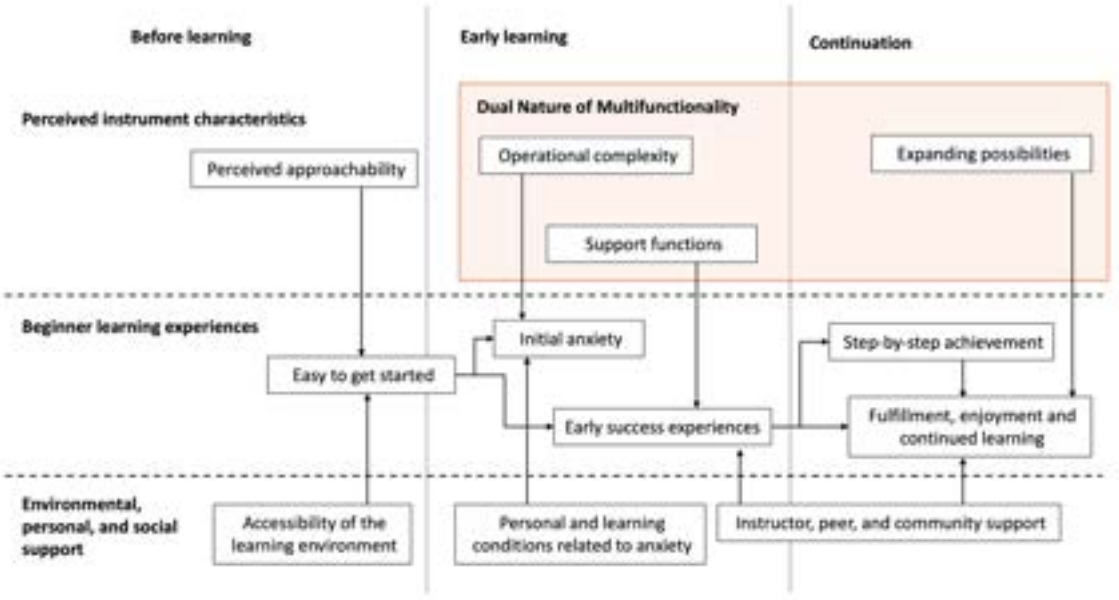

Figure 2. Conceptual model of beginner digital keyboard learning and continuation

A central implication of the model is that multifunctionality plays a dual role, both a motivational resource and a source of learning difficulty, shaping beginner-level learners' experience with the keyboard through several aspects. First, the multifunctional design in the early stage of learning was experienced by beginner-level learners through difficulty in understanding the buttons, their roles, and the procedures for using the keyboard. Moreover, the complexity of the design made it difficult for users to feel comfortable with learning since it

created feelings of uncertainty regarding the users' own abilities to cope with lessons and remember all operations, leading to lower self-efficacy. According to Bandura's (1986) framework, anxiety often stems from people's evaluation of themselves as incapable of coping with situations that seem threatening to them. At the same time, the support functions of digital keyboards provided opportunities for beginner-level learners to produce satisfying musical results, regardless their limited knowledge and skills in operating the instrument. Finally, the diversity of sound options and possible accompaniments allowed learners to imagine the possibility of future performances. This made them satisfied, pleased, and motivated to learn further.

This model further suggests that continued learning is supported by converting beginner-level learners' early success experiences to step-by-step achievements. As mentioned, the operational complexity is likely to negatively impact the beginner-level learners' self-efficacy by causing confusion about their ability to control the instrument. In contrast, digital keyboard's support functions enable learners to accomplish certain musical goals from an early stage of the learning process. Therefore, early success experiences allow learners to view it as a tool that offers the possibility to achieve meaningful musical results from the very beginning. In the continuation phase, this initial feeling of early success appears to turn into a feeling of competency as learners begin to enhance their abilities and acknowledge their progress. These experiences are expected to foster self-endorsed motivational processes by allowing learners to experience enjoyment, personal value, and a sense of possibility in continued learning. Thus, a variety of digital keyboard functions support the process of continued learning by enabling the transformation of each small accomplishment into fulfillment, enjoyment, and motivation to continue learning. This interpretation aligns with research linking self-efficacy and motivation to positive engagement and outcomes in music learning (Su et al., 2024), and to persistence through autonomous motivation (Wieser & Müller, 2024). While no direct measures of self-efficacy and autonomous motivation have been included in this study, narratives provide grounds to believe that early success experiences and accumulated accomplishments promote qualities such as confidence and motivation, and therefore encourage continued learning. Instructor, peer, and community support are also helpful in facilitating this process by assisting in overcoming obstacles, recognizing progress, and maintaining motivation.

This study does not aim to validate any particular design principle; however, some general suggestions can be derived from it. In this respect, one can say that in the case of beginner-level learners, digital keyboards with multifunctional features may be better designed when such features are introduced progressively rather than simplified. While multifunctionality is likely to be an additional source of complexity, it also contributes to achieving satisfaction earlier and imagining new opportunities. Therefore, the challenge is to preserve the positive effects of multifunctionality while reducing its negative aspects of complexity. This is in line with one of the User Experience (UX) design principles that recommends introducing only necessary options and disclosing them gradually (Nielsen, 2006).

5 CONCLUSION

This study investigated how beginner-level learners perceived digital keyboard features and the relationship between such perceptions and learner motivation to start and maintain learning. The results revealed that digital keyboards reduce barriers to learning because they are easy for beginner-level leaners to use. At the same time, their multifunctionality can contribute both to learning anxiety and learning enrichment.

These findings indicate that digital keyboards provide beginner-level learners with much more support than merely being easy to use. Learners' experience in using the multifunctionality of digital keyboards can contribute to the development of positive attitudes towards practice. At the same time, multifunctionality can generate anxiety because of its complex structure and complicated interface. Hence, for beginner-oriented digital keyboards, the design challenge is not simply to reduce the number of functions, but to make functions progressively accessible in ways that correspond to learners' developing confidence, skills, and musical goals. This challenge of overcoming difficulty in early-level learners is likely shared by other multifunctional instruments and technologies for beginner-level users, suggesting that the proposed conceptual model may serve as a useful reference for beginner-oriented design beyond the digital keyboard and pointing to future research across other instruments, technologies, and cultural contexts.

This study has several limitations. Participants were learners in beginner-level digital keyboard classes in Taiwan, mostly middle-aged or elderly, so the results may not fully reflect younger or self-directed beginner-level learners. Additionally, data were gathered through interviews only, without usability testing or observation of keyboard use in real-life situations—an important direction for future research.

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