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Evaluating the Learning Ability of a Music Theory Course in a Virtual Learning Environment Within Zhanjiang City, China

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Abstract:- During the COVID-19 pandemic, the shift to online and blended learning models became imperative for academic institutions. This study evaluated the learning ability in a music theory course within a virtual learning environment. It examined the learning capabilities of 209 junior music majors in Zhanjiang City, focusing on actions, goals, metacognitive experience, and knowledge. It also investigated links between socio-demographics, learning ability, acceptance of virtual music theory learning, and technological proficiency. The findings revealed satisfactory technological profiles, learning ability, and overall learning acceptance. Notably, a positive association existed between technological proficiency and learning acceptance, learning ability, and technological profiles. However, socio-demographics did not show a significant correlation with learning ability. Ultimately, the study emphasized the high acceptance of virtual music theory learning, primarily influenced by participants' technological adeptness.

Keywords*: Blended Learning, eLearning, ICT in Education, Music eLearning, Virtual Learning Environment.*

1. Introduction

The emergence of online education, accelerated by the COVID-19 pandemic, introduced new teaching strategies and challenges, leading to the exploration of Virtual Learning Environments (VLEs). This study concentrates on the learning ability of music theory within the VLE in Zhanjiang City, China. As education shifted online due to the pandemic, the importance of VLEs for music theory in higher education became evident. The study aims to address challenges specific to music theory education, focusing on designing innovative teaching methods and overcoming internet-related hurdles. In exploring VLE models for music theory, this study aims to enhance the quality and accessibility of online education. It identifies challenges in meeting diverse teaching needs, integrating sound signal routing, and ensuring effective online education. Technology acceptance, guided by the Unified Theory of Acceptance and Use of Technology (UTAUT), becomes pivotal in understanding students' learning ability in a virtual environment. Additionally, the study recognizes challenges in equal access to technology, digital literacy, pedagogical design, and cybersecurity in online education.

Music theory education necessitates a distinct approach due to its reliance on auditory skills and abstract concepts. Effective models for online delivery must cater to the discipline's unique requirements while maintaining instructional quality.

The objectives of this study encompass a multifaceted analysis of the respondents' learning ability within a virtual learning environment, focusing on various dimensions. Firstly, it aims to assess the respondents' learning ability across distinct facets, including actions, goals, metacognitive experience, and metacognitive knowledge. Secondly, the study explores the correlation between the socio-demographic profiles of the respondents and their level of learning ability, investigating how background factors may influence their learning capabilities. Furthermore, the research investigates the relationship between the respondents' acceptance level of learning music theory in a virtual environment and their learning ability. This objective determines whether attitudes and

willingness towards this educational environment correlate with the respondents' learning prowess. Lastly, the study aims to discern if a significant relationship exists between the technological profile of the respondents and their level of learning ability, exploring whether varying degrees of technological familiarity or proficiency impact their learning capabilities within the virtual learning setting.

The study assessed the student's ability to learn music theory in a VLE among music students during the 2022-2023 academic year. The data collected included responses from music majors at two universities in Zhanjiang City, gathered through questionnaires for research purposes only, with no intent to use the information against the schools or the Department of Education. However, the research had limitations, notably the sample's regional and population specificity, impacting the generalizability of the findings. The data collection methods introduced limitations, including potential respondent biases and restricted study duration, limiting the evaluation of long-term effects. The study focused on third-year undergraduate students, excluding first- and second-year students due to incomplete music theory courses and seniors due to their imminent graduation, potentially necessitating more time for participation and data provision. The primary audience for this research includes education practitioners, students in online education, and developers and assessors of virtual learning environments.

2. Related Literature

Enhancing students' learning ability is a crucial educational objective that can be achieved. However, it requires not only the cultivation of particular learning skills that instructors know to teach but also the enhancement of an executive control mechanism that can automatically retrieve and integrate learning skills when needed. Currently, metacognitive theorists are exploring empirical evidence suggesting specific individuals possess these automatic control mechanisms. Four factors involved are actions, goals, metacognitive experiences, and metacognitive knowledge (Derry, 1986).

Learning actions refer to individuals' cognitive processes and strategies to acquire, store, retrieve, and apply information. These actions are essential for effective learning and academic achievement. Numerous studies have investigated the various learning actions, their effects on learning outcomes, and strategies to enhance them.

One of the most critical learning actions is metacognition, which refers to an individual's ability to monitor, regulate, and control cognitive processes. Researchers have found that metacognitive skills are essential for academic success and have identified several strategies for enhancing metacognition, such as self-monitoring, self-regulation, and self-evaluation.

Music education has positively affected cognitive development, including language, memory, attention, and spatial-temporal abilities. Bugos and DeMarie (2017) investigated children who received music instruction. They revealed that the latter had better reading and verbal memory skills than children who did not. Hetland (2000) and Winner (2008) have also supported the same claim that music education improves spatial-temporal abilities, which are essential for mathematics and science.

Perceptual skills, such as auditory discrimination, are essential for music learning and proficiency. Music is a complex auditory stimulus that requires individuals to develop and refine their perceptual abilities to understand, interpret, and produce music effectively. Lappe et al. (2008) found that musicians have better auditory discrimination skills than non-musicians. In Steele's et al. (2013) research, musicians have enhanced neural processing of sound, which allows them to perceive Music more accurately. The development of perceptual skills in music learning is often achieved through formal instruction, guided practice, and active engagement with Music. Effective music education programs incorporate activities that specifically target the development of perceptual skills. These activities may include listening exercises, ear training, ensemble playing, and exposure to diverse musical styles and genres.

Various instructional methods have been used to teach Music, including traditional, computer-assisted, and game-based instruction. Effective instructional methods in music education should be tailored to the unique needs of students, promote active engagement, and provide a well-rounded learning experience. Traditional

instruction is effective in teaching music, but computer-assisted instruction can also be effective, especially for highly motivated students (McPherson, 2005).

Learning goals refer to the desired outcomes or achievements of the learning process. Educators need to establish clear learning goals as they serve as a guide to instructional planning, assessment, and evaluation. Numerous studies have examined the impact of setting specific and challenging learning goals on student achievement and motivation. Locke (1994) proposed the goal-setting theory, which suggests that specific and challenging goals lead to higher performance and motivation. The theory emphasizes the importance of setting SMART goals (specific, measurable, achievable, relevant, and time-bound) aligned with an individual's abilities and interests. A well-rounded music education program should provide a balance between individualized instruction, group collaboration, active learning, sequential skill building, and performance opportunities. By employing diverse instructional methods, music educators can create engaging and enriching learning experiences that inspire students, foster musical growth, and cultivate a lifelong love for Music. Metacognitive experiences refer to the processes of thinking and reflection about one's thinking and learning. It involves being aware of one's cognitive processes and regulating them to improve learning outcomes. A vast body of literature has explored the importance of metacognitive experiences in learning and their impact on academic achievement.

Furthermore, Flavell (1979) introduced the concept of metacognition and emphasized its significance in learning. Metacognitive experiences help individuals understand their thinking processes and how to control them to improve their learning outcomes. It also argued that metacognition is essential for self-regulated learning and that learners who possess metacognitive skills are more likely to succeed academically.

Gregory (1994) explored the relationship between metacognition and learning strategies. In this study, learners who are aware of their thinking processes and use metacognitive strategies to regulate their learning are more likely to use effective learning strategies that lead to better academic achievement. Metacognitive knowledge refers to individuals' knowledge and awareness about their cognitive processes and strategies for learning. This includes knowledge about one's strengths and weaknesses in learning and the ability to plan, monitor, and evaluate one's learning. Research has shown that metacognitive knowledge is essential for promoting effective learning and academic achievement. One key area of research on metacognitive knowledge has been the development of metacognitive awareness and regulation in young learners. Several studies have suggested that metacognitive training can improve academic performance and enhance self-regulation skills in children (Aamir, 2020). Another area of research has been the role of metacognitive knowledge in higher education. Research has suggested that metacognitive knowledge is vital for promoting effective learning and academic success in college students. Studies have also found that metacognitive strategies can improve academic performance in college students (Williamson, 2015).

Learning ability refers to an essential and viable educational goal. Four factors involved are actions, goals, metacognitive experiences, and metacognitive knowledge (Derry, 1986). These factors are critical to the students' cognitive development, enabling them to acquire and retain knowledge and skills. It is the capacity to adapt to new situations and challenges. It plays a vital role in the student's personal and professional growth. Learning ability is essential for personal growth, allowing instructors to broaden students' horizons and explore new ideas. Learning ability is also crucial for professional growth. In today's fast-paced world, learning new skills and adapting to new technologies is essential for career success. Employers value employees who are willing to learn and develop their skills, as it helps to drive innovation and growth within the organization.

Moreover, having good learning abilities can help instructors stay competitive in the job market and take advantage of new career opportunities. Learning ability is broader than formal education or professional development. Lifelong learning is the process of acquiring knowledge and skills throughout the students' lives, and it is essential for personal and professional growth. By embracing lifelong learning, instructors can stay relevant and competitive in the students' careers and continue to pursue the students' interests and passions. It can also help instructors to stay mentally sharp and active as they age and to maintain a sense of purpose and fulfillment in the students' lives. Learning ability is a critical factor in personal and professional growth. It

enables instructors to adapt to new situations, broaden the students' horizons, and pursue the students' goals and aspirations. As instructors continue to navigate an ever-changing world, instructors must prioritize learning and embrace lifelong learning as a way of life.

3. Methods

This study employed a descriptive-correlational approach to investigate participants' socio-demographic profiles, acceptance level in a music theory course, and learning ability within a higher education setting. The research was conducted in two universities in Zhanjiang City, Guangdong Province, involving third-year undergraduate students.

The selected participants were junior college students due to their 2020 enrollment during the COVID-19 pandemic. Complete enumeration was used, involving all students participating in the VLE model, offering precise representation but also time-consuming data collection and potential biases from non-participation.

Data was collected through a questionnaire assessing various aspects, including gender, geographic location, technological familiarity, parental education, and learning initiative. The questionnaire included a section examining learning ability, focusing on actions, goals, metacognitive experiences, and metacognitive knowledge.

The pretest involved 30 second-year undergraduate music students at a public university. The test-retest method was conducted at a one-week interval through a WeChat mini-program called "Question Star," administered in Zhanjiang City, Guangdong Province. The collected data underwent various statistical analyses, such as Cronbach alpha, percentage, weighted mean, standard deviation, chi-square test, Spearman's rho, and Kruskal-Wallis's test.

Ethical considerations guided the study, ensuring participant welfare and data security. Ethical principles, including ensuring no harm to participants, obtaining full consent, protecting privacy and confidentiality, and maintaining honesty in research communication, were strictly adhered to throughout the study. The study was submitted for approval to the University Research Ethics Committee (UREC).

4. Results and Discussion

A. Profile of Respondents

During the second semester of the 2022-2023 school year, total student enrollment was 209. To conduct the study, the researcher derived a sample size of 209 using complete enumeration, also known as census sampling. This method entails selecting the entire population of interest as the sample. This study included all students actively engaged in the VLE model as participants. Detailed data interpretation is shown in Table 1.

Table 1. Demographic Profile of the Respondents

Class	**Total**	
	f	**%**
School 1: A	38	18.2
School 1: B	54	25.8
School 1: C	57	27.2
School 2: A	30	14.4
School 2: B	30	14.4
Total	**209**	**100**
Sex	***f***	**%**
Female	152	72.73
Male	57	27.27

Total	**209**	**100.00**
Age	***f***	**%**
≤ 19	10	4.78
v20-25	197	94.26
≥ 26	2	0.96
Total	**209**	**100.00**
Parents' Background in Music	***f***	**%**
Yes	13	6.22
No	196	93.78
Total	**209**	**100.00**

Within this sample, females comprise a more significant proportion, with 152 respondents representing 72.73% of the total sample. The number of males is 57, accounting for 27.27% of the total sample. Regarding age, the data shows 10 participants aged ≤ 19, accounting for 4.78% of the total sample. Participants aged between 20 and 25 numbered 197, representing 94.26% of the total sample. Only 2 participants are aged ≥ 26, making up only 0.96% of the total sample. Based on the data, there are 13 participants, 6.22 % of the total sample, with a background in music representation. One hundred ninety-six participants have no background in Music, accounting for 93.78% of the total sample. This indicates that most participants' parents do not have a background in Music. In contrast, only a few participants have parents with a musical background.

B. Learning Ability

Table 2 shows the respondents' level of learning ability. Specifically, it presents the learning ability regarding action, goals, experiences, and knowledge. It presents mean scores and standard deviations for different categories: actions, goals, experiences, and knowledge. Each category has an aggregate mean score and a verbal description (VD) that summarizes the central tendency or average. The purpose of the table is to provide an overview of the respondents' perspectives and attitudes related to these categories. The main focus or theme of the table is to assess the respondents' agreement or disagreement with statements in each category. The categories represent different aspects of the survey or research topic, and the table helps analyze the respondents' perceptions and beliefs in these areas.

Table 2. Respondents' Level of Learning Ability

Actions	**WX**	**s**	**VD**
I believe that taking proactive actions is essential for effective learning.	2.93	0.73	A
I usually take action to address any learning difficulties I encounter.	2.90	0.65	A
I am often motivated to take action to improve my learning outcomes.	2.81	0.66	A
I often seek feedback on my actions to ensure I am on the right track in my learning.	2.78	0.70	A
I find it easy to identify which actions I should take to improve my learning.	2.69	0.67	A
Aggregate	2.82	0.57	A
Goals	**WX**	**s**	**VD**

I have broader learning goals, such as improving my cognitive ability or developing personal interests.	2.87	0.71	A
I find it helpful to prioritize my goals and focus on the most important ones first.	2.87	0.68	A
I am able to set clear learning goals for myself.	2.80	0.70	A
7. I wanted to learn new things and expand my understanding, but I had no clear goal.	2.79	0.72	A
8. I set specific learning goals, such as achieving certain grades or mastering certain skills.	2.77	0.67	A
Aggregate	2.82	0.61	A
Experiences	**WX**	**s**	**VD**
Learning from past experiences is important to me.	2.95	0.67	A
The experiential learning opportunities (e.g., internships, service learning) in my courses have been valuable for my overall learning.	2.91	0.68	A
I believe that my learning experiences have helped me to grow and develop as a person.	2.88	0.70	A
The learning experiences in my courses have helped me understand complex concepts better.	2.86	0.67	A
I find it helpful to learn from the experiences of others.	2.81	0.72	A
Aggregate	2.88	0.60	A
Knowledge	**WX**	**s**	**VD**
I believe that having a solid foundation of knowledge is important for learning new things	2.87	0.69	A
I enjoy learning about new topics and expanding my knowledge.	2.78	0.70	A
I find that I am able to apply what I have learned in one subject to other subjects as well.	2.74	0.67	A
I feel that I have a strong understanding of the knowledge and concepts in my field of study	2.68	0.69	A
I feel that I have a good grasp of the foundational knowledge required for my field of study.	2.64	0.75	A
Aggregate	2.74	0.61	A

**1.00-1.74=Disagree(D); 1.75-2.49=Somewhat Agree (SA); 2.50-3.24=Agree(A); 3.25-4.00=Strongly Agree (SA)*

By presenting the mean scores and standard deviations, the table allows for a comparison between the different categories. It provides insights into the level of agreement or disagreement among the respondents and highlights areas of consensus or variation in their perspectives. This information is relevant to the analysis as it helps identify the overall trends and tendencies of the respondents in each category. It explains their attitudes, experiences, and knowledge related to the survey topic. These insights can inform further investigation, decision-making, and the development of interventions or strategies to address any gaps or challenges identified.

According to Carroll (1993) and Kolligian (1987), indices of learning and intelligence are highly correlated. However, the result contradicts Bornstein's (1986) and Vietze's (1986) studies, wherein the preference for novelty positively correlates with later performance on standardized IQ test batteries. In other words, learning ability has a lot to do with novelty.

Action

Table 2 shows that the action ability of the respondents has an aggregate mean of 2.82, suggesting that the respondents agree with the statements about proactive actions for effective learning. It indicates that the respondents generally recognize the importance of proactive actions and believe they are essential for effective learning. This insight is significant as it highlights the respondents' understanding of the active role they need to play in their learning process. It suggests a positive attitude towards taking the initiative and responsibility for their learning outcomes.

Taking proactive actions for effective learning secured the highest mean value of 2.93. This indicates that the respondents strongly agree with the importance of proactive actions for effective learning. The findings reinforce that the respondents understand the value of being proactive and taking the initiative in their learning process. It also indicates that they perceive proactive actions as necessary for achieving their learning goals.

On the other hand, identifying actions to improve one's learning earned the lowest mean value of 2.69. This suggests that the respondents face challenges in identifying the specific actions they should take to improve their learning, highlighting a potential area for improvement. It indicates the need for support or guidance in helping respondents recognize and determine appropriate actions to enhance their learning outcomes.

The high mean value of 2.90 indicates that the respondents generally demonstrate a proactive approach to addressing their learning difficulties. It reflects their motivation and willingness to take action to overcome challenges and enhance their learning experience.

The respondents' agreement with the importance of proactive actions for effective learning suggests a positive attitude toward taking the initiative. However, the slight agreement in finding it easy to identify appropriate actions implies a need for support or guidance. These insights can inform interventions or strategies to promote and enhance proactive learning behaviors among the respondents.

Goals

The aggregate mean of goal ability is 2.82, denoting that the respondents generally recognize the importance of having learning goals and prioritize them to some extent. This insight is significant as it highlights the respondents' understanding of the role of goals in their learning process. It suggests a positive attitude towards setting clear goals and focusing on important ones.

Moreover, respondents agree with broader learning goals beyond specific achievements or grades, with a mean of 2.87. In other words, the respondents value learning goals beyond mere academic achievements. They recognize the importance of cognitive development and personal interests as integral parts of their learning journey. This result reinforces the idea that the respondents have a broader perspective on learning and understand the value of setting goals that encompass personal growth and lifelong learning.

On the other hand, respondents may not prioritize setting specific learning goals tied to grades or skills as much as broader learning goals, revealing the lowest mean value of 2.77. This insight highlights a potential focus on intrinsic motivation and personal growth rather than external outcomes. The respondents may value the process of learning and the development of cognitive abilities more than achievement-oriented goals.

Notably, respondents recognize the importance of having clear goals in their learning process. They may sometimes need more clarity (mean of 2.79). It highlights the need for support or guidance in helping respondents articulate and define their learning goals to facilitate effective learning.

The agreement with broader learning goals and the recognition of the importance of prioritization suggest a positive attitude towards goal setting and focusing on meaningful objectives. However, the slight agreement

with setting specific learning goals tied to grades or skills indicates a potential emphasis on intrinsic motivation and personal growth. These insights can inform interventions or strategies to promote practical goal setting and align them with the respondents' broader learning aspirations.

Experiences

Experience ability has an aggregate mean of 2.88, suggesting that the respondents recognize the importance of past experiences, experiential learning opportunities, and learning from others in their learning process. This insight is significant as it highlights their value on practical learning, personal growth, and applying knowledge in real-world contexts.

The respondents strongly agree with learning from past experiences, with the highest mean value of 2.95. This demonstrates that the respondents highly value the learning opportunities provided by their previous experiences. They recognize the potential for personal growth and the transfer of knowledge gained from past situations to current and future learning contexts. This result underscores the significance of reflective learning and integrating prior knowledge and experiences into the learning process.

On the other hand, the low mean value of 2.81 revealed that the respondents may prioritize learning from the experiences of others less than their own experiences or other types of learning. They may rely more on personal experiences or direct engagement with the subject matter rather than seeking out the experiences of others as a learning resource.

Interestingly, the importance of experiential learning opportunities (e.g., internships, secured a mean of 2.91, underscoring the positive impact of hands-on experiences, such as internships or service learning, on their learning outcomes. The strong agreement with learning from past experiences and recognizing the value of experiential learning opportunities suggest a positive attitude towards practical learning and personal growth. However, the slight agreement with learning from the experiences of others indicates a potential focus on individual experiences and direct engagement with the subject matter. These insights can inform the design of learning experiences and highlight the importance of incorporating experiential learning opportunities to enhance learning.

Knowledge

As exhibited in Table 2, the respondents agree with the knowledge-related statements (aggregate mean of 2.74), indicating that they recognize the importance of having a solid foundation of knowledge, enjoying learning new topics, and the applicability of knowledge across different subjects. This insight is significant as it highlights their value in acquiring and expanding knowledge and the interconnection between different areas of study.

Moreover, respondents agree strongly with the importance of a solid knowledge foundation. The high mean value of 2.87 suggests that the respondents recognize the fundamental role of foundational knowledge in the learning process. They understand that a solid knowledge base is crucial for acquiring and understanding new information effectively. This result underscores the importance of building a solid knowledge base to support continuous learning and intellectual growth.

On the other hand, the respondents may need more certainty about their grasp of foundational knowledge in their respective fields of study. Based on the low mean value of 2.64, they may need further consolidation and confidence in understanding essential concepts and principles.

It can also be seen that respondents apply what they have learned in one subject to other subjects. They recognize the transferability of knowledge across different subjects. It highlights their ability to connect and apply what they have learned in one area to other areas of study, promoting a holistic and interconnected approach to learning.

The agreement with the importance of a solid knowledge foundation and the enjoyment of learning new topics suggests a positive attitude towards knowledge acquisition. However, the slightly lower agreement with feeling a good grasp of foundational knowledge in one's field suggests a potential area for further improvement and confidence-building. These insights can inform educational strategies that emphasize the development of a solid

knowledge base and promote interdisciplinary thinking and the application of knowledge across various subjects.

C. Relationship Between the Respondents' Socio-Demographic Profile and Their Level of Learning Ability

Table 3 presents correlation coefficients (rs) and chi-square values (χ^2) that indicate the strength of the relationship between different variables. The relationships between sex and actions, goals, experiences, knowledge, and overall are not statistically significant, as indicated by the high p-values (greater than 0.05). Similarly, the relationships between age and the same set of variables and between parents' musical background and actions, goals, experiences, knowledge, and overall are also insignificant.

Table 3. Relationship Between the Respondents' Socio-Demographic Profile and Their Level of Learning Ability

Variables	**Correlation Coefficient χ^2**	**P**	**Remarks**
Sex and actions	5.66	0.13	Not significant
Sex and goals	1.21	0.75	Not significant
Sex and experiences	4.61	0.20	Not significant
Sex and knowledge	1.35	0.72	Not significant
Sex and overall	**4.17**	**0.24**	**Not significant**
	Rs	**P**	
Age and actions	0.03	0.69	Not significant
Age and goals	0.05	0.45	Not significant
Age and experiences	0.05	0.22	Not significant
Age and knowledge	0.01	0.80	Not significant
Age and overall	**0.04**	**0.59**	**Not significant**
	χ^2	**P**	
Parents' musical background and actions	4.17	0.24	Not significant
Parents' musical background and goals	4.36	0.23	Not significant
Parents' musical background and experiences	4.89	0.18	Not significant
Parents' musical background and knowledge	3.97	0.26	Not significant
Overall, the parents' musical background	**6.03**	**0.11**	**Not significant**

The lack of significant relationships between sex, age, parents' musical background, and the variables of actions, goals, experiences, and knowledge suggests no strong association or correlation between these factors. This means that sex, age, or parents' musical background may not substantially impact the measured variables in the study context. These findings indicate that these demographic or background factors may not significantly shape individuals' actions, goals, experiences, knowledge, or overall perceptions in the investigated domain.

No other patterns or notable findings emerge from Table 3. All the relationships examined do not reach statistical significance. It is important to acknowledge potential limitations in the analysis. Factors such as sample size, measurement instrument sensitivity, or the study's specific context may influence the lack of significant relationships. Additionally, the absence of statistical significance does not necessarily imply a lack of practical importance or real-world relevance but instead suggests that the relationships between the variables in this study were not strong enough to be detected, given the available data.

The key findings suggest that sex, age, and parents' musical background may not significantly influence the investigated context's actions, goals, experiences, knowledge, or overall perceptions. These variables may not be crucial in shaping individuals' behaviors, aspirations, learning experiences, knowledge acquisition, or overall evaluations. These findings indicate the need to explore further other factors contributing to the variables studied. Future research can focus on additional demographic, psychological, or contextual factors to better understand the influences on the variables of interest.

D. Relationship Between Level of Acceptance and Level of Learning Ability

Table 4 presents correlation coefficients that indicate the strength of the relationship between different variables. The coefficients range from 0.13 to 0.66. All the relationships between performance expectancy, effort expectancy, attitude toward using technology, social influence, facilitating conditions, self-efficacy, anxiety, and behavioral intention to use the system are statistically significant, as indicated by the p-values (less than 0.05).

Table 4. Relationship between level of acceptance and level of learning ability

Performance Expectancy and	**rs**	**p**	**Remarks**
Action	0.51	0.00*	significant
Goals	0.60	0.00*	significant
Experience	0.49	0.00*	significant
Knowledge	0.60	0.00*	significant
Overall	**0.57**	**0.00***	**significant**
Effort Expectancy and			
Action	0.44	0.00*	significant
Goals	0.53	0.00*	significant
Experience	0.45	0.00*	significant
Knowledge	0.56	0.00*	significant
Overall	**0.52**	**0.00***	**significant**
Attitude Toward Using Technology and			
Action	0.49	0.00*	significant
Goals	0.57	0.00*	significant
Experience	0.48	0.00*	significant
Knowledge	0.63	0.00*	significant
Overall	**0.58**	**0.00***	**significant**
Social Influence and			
Action	0.49	0.00*	significant
Goals	0.51	0.00*	significant
Experience	0.45	0.00*	significant

Knowledge	0.60	0.00*	significant
Overall	**0.54**	**0.00***	**significant**
Facilitating Conditions and			
Action	0.52	0.00*	significant
Goals	0.56	0.00*	significant
Experience	0.52	0.00*	significant
Knowledge	0.64	0.00*	significant
Overall	**0.60**	**0.00***	**significant**
Self-efficacy and			
Action	0.54	0.00*	significant
Goals	0.61	0.00*	significant
Experience	0.58	0.00*	significant
Knowledge	0.66	0.00*	significant
Overall	**0.63**	**0.00***	**significant**
Anxiety and			
Action	0.23	0.00*	significant
Goals	0.25	0.00*	significant
Experience	0.13	0.06	Not significant
Knowledge	0.31	0.00*	Significant
Overall	**0.25**	**0.00***	**significant**
Behavioral Intention to Use the System and			
Action	0.36	0.00*	significant
Goals	0.38	0.00*	significant
Experience	0.35	0.00*	significant
Knowledge	0.43	0.00*	significant
Overall	**0.38**	**0.00***	**significant**
Overall Action	0.54	0.00*	significant
Overall Goals	0.60	0.00*	significant
Overall Experience	0.51	0.00*	significant
Overall Knowledge	0.66	0.00*	significant
Overall	**0.61**	**0.00***	**significant**

The significant relationships indicate strong associations between these variables. Performance expectancy, effort expectancy, attitude toward using technology, social influence, facilitating conditions, self-efficacy, and behavioral intention to use the system positively correlate with actions, goals, experience, knowledge, and overall perception. This suggests that individuals who have higher expectations, find technology easy to use, have positive attitudes, perceived social influence, have supportive conditions, possess self-efficacy, and intend

to use the system are more likely to engage in actions, set goals, gain experience, acquire knowledge, and have a positive overall perception in the given context. The positive relationships imply that these factors play a crucial role in influencing individuals' behaviors, perceptions, and intentions. These findings are corroborated by Almaiah's et al. (2019) contention:

> *Perceived information quality, perceived compatibility, perceived trust, perceived awareness, availability of resources, self-efficacy, and perceived security are the primary motivators of students' acceptance of mobile learning systems and, consequently, success in implementing mobile learning projects. Results from this study provide the necessary information on how higher education institutions can enhance students' acceptance of mobile learning systems and support the usage of mobile technologies in the learning and teaching process (p. 97).*

Insufficient technical support discouraged teachers from using ICT in teaching while increasing adequate equipment and technical support in schools encouraged teachers in this respect (Mirzajani, 2016).

It is important to acknowledge potential limitations in the analysis. The findings are based on the study's specific context, and the relationships observed may vary in different contexts or populations. Additionally, the significant relationships provide evidence for associations but do not establish causation. Other unmeasured variables or factors could also influence the observed relationships.

The key findings highlight the importance of performance expectancy, effort expectancy, attitude toward using technology, social influence, facilitating conditions, self-efficacy, anxiety, and behavioral intention to use the system in shaping individuals' actions, goals, experiences, knowledge, and perceptions. These factors play significant roles in determining individuals' engagement with technology and their perceptions of its usefulness and ease of use. The findings underscore the importance of considering these factors when designing interventions or strategies to promote technology adoption and usage. Understanding these relationships can help researchers and practitioners develop practical approaches to enhance individuals' engagement and acceptance of technology.

E. Relationship between Technological Profile and Learning Ability

Table 5 presents correlation coefficients ranging from 0.27 to 0.45, indicating moderate to strong positive relationships between ICT professional skills, internet skills, actions, goals, experience, knowledge, and overall perception. All the relationships between ICT professional skills, internet skills, and the various outcome variables (actions, goals, experience, knowledge, and overall) are statistically significant, as indicated by the p-values (less than 0.05).

Table 5. Relationship between Technological Profile and Learning Ability

ICT Professional Skills and	**rs**	**p**	**Remarks**
Action	0.42	0.00*	significant
Goals	0.45	0.00*	significant
Experience	0.38	0.00*	significant
Knowledge	0.41	0.00*	significant
Overall	**0.42**	**0.00***	**significant**
Internet Skills and			
Action	0.31	0.00*	significant
Goals	0.36	0.00*	significant
Experience	0.37	0.00*	significant
Knowledge	0.27	0.00*	significant
Overall	**0.31**	**0.00***	**significant**

The significant relationships suggest that individuals with higher levels of ICT professional and internet skills are more likely to engage in actions, set goals, gain experience, acquire knowledge, and have a positive overall perception. These skills influence individuals' behaviors and perceptions in the given context. Strong ICT professional and internet skills enable individuals to effectively utilize technology, navigate online platforms, and enhance their overall performance and engagement. The findings highlight the importance of developing and improving these skills to succeed in an ICT-driven environment. As posited by Thompson (2013), "Students' lives today are saturated with digital media at a time when their brains are still developing." The empirical analysis shows some strength in the relationship between technological learning and market performance (Carayannis, 2002).

It is important to acknowledge potential limitations in the analysis. The findings are based on the study's specific context, and the relationships observed may vary in different contexts or populations. Additionally, the significant relationships provide evidence for associations but do not establish causation. Other unmeasured variables or factors could also influence the observed relationships.

The key findings underscore the significance of ICT Professional Skills and Internet Skills in shaping individuals' actions, goals, experiences, knowledge, and overall perceptions. The results highlight the importance of acquiring and enhancing these skills to thrive in the digital age. Organizations and individuals can benefit from investing in training and development programs to improve ICT Professional and Internet Skills. This can lead to increased productivity, better utilization of technology, and improved outcomes in various domains. The findings emphasize the relevance of these skills to the research question or objective and highlight their potential implications for individuals and organizations operating in technology-driven environments.'

5. Conclusions and Recommendations

The study's key conclusions centered on the learning ability of music theory in a virtual learning environment. While socio-demographic factors such as gender, age, and parental musical backgrounds showed no significant influence on learning ability, a strong positive link was found between overall acceptance levels and various aspects of learning ability, encompassing actions, goals, experiences, and knowledge. Notably, individuals with higher proficiency in ICT and internet skills displayed enhanced learning abilities. This underscores the importance of developing and improving technological skills for effective learning in the virtual music theory context. Additionally, the study emphasized the need to address challenges related to support, resources, and technical assistance to enhance the overall effectiveness of learning music theory in a virtual environment.

The research findings propose vital recommendations to bolster the learning ability of music theory in a virtual learning environment. First, there is a crucial need to integrate technology into the music theory curriculum, leveraging its advantages to enhance educational content interaction and improve learning outcomes. Specific initiatives include guiding and supporting female students, nurturing enthusiasm for the virtual learning environment, and encouraging participation in online discussions. There is also an emphasis on assisting students in setting goals and fostering deeper comprehension of the subject matter.

Moreover, improving students' and teachers' ICT and internet skills is essential. Strengthening these competencies is crucial for effective adaptation to learning music theory in a virtual setting, ensuring optimal use of available technological resources. The recommendations further highlight the importance of overcoming potential limitations such as gender, age, and family background that might affect students' learning abilities.

Involving stakeholders is crucial for effective integration. School managers, students, and teachers must participate actively in these initiatives. They are encouraged to promote inclusivity, maintain positive attitudes, and utilize support to address challenges faced in the virtual learning environment.

The recommendations additionally propose conducting further research to explore the relationship between students' learning abilities and music study preparation. This focus aims to help educators better understand how to prepare students effectively, achieving better outcomes in music education. Such research is expected to offer

valuable insights for enhancing teaching methods and strategies in music education promoting comprehensive student development and growth.

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