A FORMATIVE ASSESSMENT STRATEGY FRAMEWORK FOR HIGHER ORDER THINKING SKILLS IN ONE-TO-ONE WESTERN CLASSICAL INSTRUMENTAL MUSIC EDUCATION

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ABSTRACT

Higher-order thinking skills (HOTS) are essential in one-to-one classical music instruction, as they deepen students' musical understanding, foster creative interpretation, and cultivate independent problem-solving in artistic contexts. Scholarly research highlights formative assessment as a pivotal instructional practice for promoting HOTS in the classroom. However, Western Classical Instrumental Music (WCIM) instructors often lack adequate formative assessment strategies to effectively stimulate students' HOTS. Addressing this gap, this study developed a framework to enhance HOTS practices in higher education one-to-one instrumental music teaching. The framework was developed through a three-phase design and development research (DDR) approach, comprising needs analysis, design and development, and evaluation. By purposive sampling approach, data were collected from 538 students, 35 WCIM instructors in higher education, and three educational experts using mixed methods, including questionnaires, semi-structured interviews, focus group discussions (FGD), adversarial interpretive structural modeling (AISM), and the fuzzy Delphi method (FDM). The resulting framework features a topology diagram outlining five distinct domains (Identifying problems and proposing potential solutions, Trying to solve problems, Reflections, Summaries, and Transfers), consisting 14 formative assessment strategies. Internal validation confirmed the framework's suitability for WCIM one-to-one higher education settings, demonstrating practical utility in enhancing students' HOTS. A key contribution of this study is its focus on HOTS development in instrumental music pedagogy, which is a relatively less explored area. Additionally, the framework holds potential for broader applications, including practical implication on HOTS development under individualized learning contexts. Researchers call for a broader focus on the development of students' thinking skills in WCIM instruction. This not only boosts students' confidence and ability to tackle challenges in their professional and personal lives but also contributes significantly to the overall development of the WCIM instrucation and industry.

Pembangunan Kerangka Strategi Pentaksiran Formatif untuk Amalan Kemahiran Berfikir Aras Tinggi dalam pengajaran Individu Muzik Instrumental Klasik Barat bagi Pendidikan Tinggi

ABSTRAK

Kemahiran Berfikir Aras Tinggi (KBAT) merupakan elemen penting dalam pengajaran muzik klasik Barat secara individu kerana ia memperkukuh pemahaman muzik pelajar, menggalakkan interpretasi kreatif, serta memupuk keupayaan menyelesaikan masalah secara autonomi dalam konteks artistik. Kajian terdahulu telah menekankan bahawa penilaian formatif ialah amalan pedagogi yang berkesan dalam memupuk KBAT di bilik darjah. Namun begitu, pensyarah muzik instrumental klasik Barat (MIKB) masih kurang memiliki strategi penilaian formatif yang sistematik bagi merangsang KBAT pelajar secara berkesan. Menyedari jurang ini, kajian ini telah membangunkan satu kerangka untuk meningkatkan amalan KBAT dalam pengajaran individu muzik instrumental di peringkat pendidikan tinggi. Kerangka ini dibangunkan melalui pendekatan Penyelidikan Reka Bentuk dan Pembangunan (Design and Development Research, DDR) tiga fasa, iaitu analisis keperluan, reka bentuk dan pembangunan, serta penilaian. Data dikumpul melalui kaedah pensampelan bertujuan melibatkan 538 pelajar, 35 pensyarah MIKB di institusi pengajian tinggi, dan tiga pakar pendidikan. Pendekatan kaedah campuran digunakan, termasuk soal selidik, temu bual separa berstruktur, perbincangan kumpulan fokus (FGD), pemodelan struktur tafsiran konfrontatif (Adversarial Interpretive Structural Modeling, AISM), serta kaedah fuzzy Delphi (FDM). Hasil kajian menghasilkan sebuah kerangka yang merangkumi rajah topologi lima domain utama, iaitu (i) Mengenal pasti masalah dan mencadangkan penyelesaian berpotensi, (ii) Menyelesaikan masalah, (iii) Refleksi, (iv) Rumusan, dan (v) Pemindahan pengetahuan. Kerangka ini mengandungi sebanyak 14 strategi penilaian formatif. Pengesahan dalaman membuktikan kesesuaian kerangka ini digunakan dalam konteks pengajaran individu MIKB di peringkat pendidikan tinggi, serta menunjukkan potensi praktikal dalam mempertingkatkan penguasaan KBAT dalam kalangan pelajar. Sumbangan utama kajian ini ialah tumpuannya terhadap pembangunan KBAT dalam pedagogi muzik instrumental, yang masih kurang diterokai dalam wacana penyelidikan. Selain itu, kerangka ini berpotensi untuk diperluas penggunaannya dalam konteks pembelajaran secara individu yang lain, khususnya bagi memperkukuh pembangunan KBAT secara lebih sistematik dan berfokus.

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LIST OF ABBREVIATIONS

AISM	Adversarial Interpretive Structural Modeling
CFA	Confirmatory Factor Analysis
CVI	Content Validity Index
DBR	Design-Based Research
DDR	Design and Development Research
DV	Defuzzification Value
EFA	Exploratory Factor Analysis
FDM	Fuzzy Delphi Method
FGD	Focus Group Discussion
HIP	Historically Informed Performance
HOT	Higher Order Thinking
HOTS	Higher Order Thinking Skills
I-CVI	Item Content Validity Index
ISM	Interpretative Structural Modeling
KMO	Kaiser-Meyer-Olkin
LOT	Lower Order Thinking
LOTS	Lower Order Thinking Skills

MICMAC	Impact Matrix Cross-Reference Multiplication Applied to a Classification
PBL	Problem-based Learning
S-CVI	Scale Content Validity Index
SSIM	Structured Self-Interaction Matrix
WCIM	Western Classical Instrumental Music
WCIM-HOTS	Higher Order Thinking Skills of Western Classical Instrumental Music

CHAPTER 1

INTRODUCTION

1.1 Introduction

Science and technology advancements have accelerated information transmission while changing people's understanding of society and their examination of self-identity. In this vein, modern research in teaching and learning has undergone significant shifts (Malik, 2018). Both teachers and students easily attain information via technology development (Basal, 2015). Scholars are emphasising the need to examine teaching effectiveness based on what students (rather than only teachers) do (Glaser et al., 2001). For example, Healey (2005) asserted the significance of integrating activity with critical thinking rather than depending on the concept alone to generate learning. The underlying learning methods applied to the problems currently underlying a discipline must be seriously considered.

Many countries and institutions worldwide have listed higher order thinking skills (HOTS) as the fundamentals of the literacy framework (European Union, 2018; Curriculum Development Division, Ministry of Education Malaysia, 2014). Based on relevant scholars, HOTS is key to solving new problems via novel knowledge applications, links, and modifications (Grabinger & Dunlap, 1995; Miri et al., 2007; Scully, 2019). Students who aim to apply and manipulate newly acquired information to address unique new situations must improve their HOTS.

Most researchers have highlighted the need for college students to apply HOTS and improve their employability in the 21st century (Mainali, 2013). In preparing for future careers, teaching students to follow directions and instructions would significantly benefit potential employers. Notwithstanding, current employers encourage students to hone decision-making and critical and creative thinking skills before entering the workforce (Heong et al., 2012). Graduates in the era of artificial intelligence must transcend beyond merely knowing basic facts and skills. Technological advancements render facts easy to obtain, with basic repetitive tasks replaced by machines. Students who apply HOTS can holistically view concepts and reflect the attitudes of effective thinkers. Given their metacognitive competence, effective thinking attitudes demonstrate underlying characteristics and values (Lau, 2015). Students who intend to become lifelong learners with the creativity to succeed must master decision-making, sequencing, strategy, and collaborative problem-solving skills. Meanwhile, teachers who support lifelong learning goals in

schools play a vital role in providing students with meaningful opportunities. Helterbran (2005) proposed guiding students to practise higher order thinking (HOT) rather than abandoning the effort.

1.2 Research Background

Western classical music (WCM) is also known as ‘classical music' or ‘Western art music'. The former is the layman's term (Bull, 2019), while the latter is often used in academic research (Becker, 1986; Klein, 2005; Drummond, 2010). From a scholarly perspective, WCM is a genre with a common orientation (Neale & Chater, 1980). Some researchers have described classical music as a practice that i) reproduces the canon of music composed between 1750 and 1950 from the pentatonic, ii) uses acoustic instruments, and avoids post-1900 techniques (Small, 1996; Green et al., 2004). As such, WCM strives to make history in sound while creating inspiring and moving musical experiences from the composer's score with astonishing reliability and skill (Butt, 2002; Leech-Wilkinson, 2020). The teaching of WCM performance is significantly influenced by the practice of WCM, with an inextricable link to the WCM culture.

One-to-one is a typical model or form of individual music instruction used to teach WCIM (Carey & Grant, 2015). Dating back to the Middle Ages, this type of music education has practised traditions that were formalised with the introduction of conservatoire teaching in the 19th century. Most instrumental instructions occur in a one-to-one environment, resembling an apprenticeship with undertones of authoritarian approaches to pedagogy (Nerland, 2007; McPhail, 2010). Founded on hands-on knowledge, know-how, or skill, this method requires practical knowledge that is acquired through modelling, demonstration, imitation, and application. The master teachers in this tradition are cognizant of the goals and ways to achieve them (Westerlund, 2006, p. 120). In this context, an instructivist approach regards the student as the receiver of pre-determined instructional knowledge.

The teacher clarifies the norms of playing in the guidance to copy and continue its values in one-to-one WCIM teaching. Music heritage and written notation may be notable aspects of formal teaching (Carey et al., 2013; Casas-Mas et al., 2014). Bull (2019) claimed that one-to-one WCIM teaching has avoided the technological and social shifts of the 20th and 21st centuries and maintained specific traditions to realise and retain musical cultural beliefs and practical needs. These traditions are exemplified as follows: rationally respecting the music score and the composer's wishes (Djahwasi & Saidon, 2022; Gaunt, 2008; Benson, 2003); prioritising the expression of style and character in musicality (Kurmanaev, 2016); emphasising technique and craft (Jorgensen, 2020; Gaunt & Westerlund, 2021); practising with

persistence and deliberation (Lindgren & Ericsson, 2010; Passarotto et al., 2022); and emphasising metaphor in hearing (Schippers, 2006; Cox, 2016; Schaerlaeken et al., 2019, 2022).

These relatively stable traditions have stood the test of time. Students are taught that creating sound requires a faithful belief in following the score and composer's intent (Dipert, 1980). Teachers train students to believe in and perform the best way of presenting the music. A performer in an ideal context of WCIM teaching is focused as a listener with the body on autopilot. Subsequently, much pleasure and satisfaction are generated when the body, intellect, and emotions are fully engaged (Koelsch, 2012). Daily technique lessons are the dominant learning mode that refines the student's technical skills (Ng et al., 2022). In WCIM teaching, researchers and teachers tend to examine how sound acts on and creates powerful emotional states through the body. Concurrently, practitioners regard classical music as a physical practice of control and restraint (Johnson & Graziano, 2003).

Some researchers have questioned the current mainstream pedagogy of WCIM teaching, which contradicts modern public teaching goals (Jorgensen, 2020). For example, López-Íñiguez and Pozo (2014) criticised traditional WCIM teachers for transferring their pedagogical beliefs to their students. Carey and Grant's (2015) research in Australia paralleled that of Bautista (2010) regarding European music conservatories. In this vein, some students do not expect to be independent and be

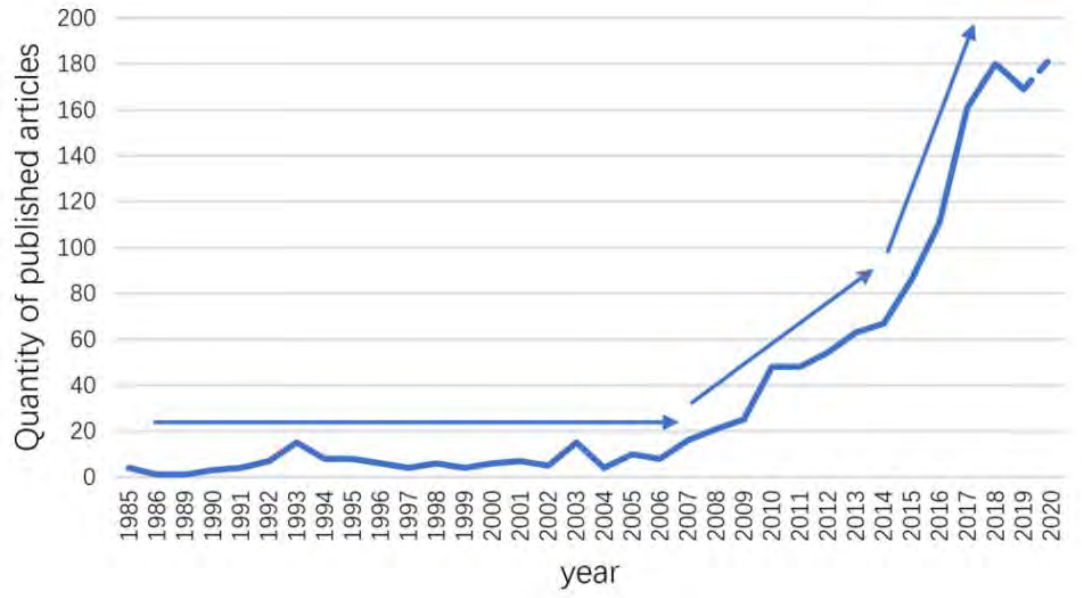
equal knowledge builders with teachers. This problem was exacerbated during the spread of COVID-19, which led numerous teachers and students to choose distance learning since 2020 (Bahar & Okay, 2021; Omur & Sonsel, 2021; Akgul, 2022; Ünlü, 2022). Consequently, instrumentation educators began lowering their expectations to meet the application of essential components to accommodate the barriers resulting from the instrumentation problem (Omur, 2021). Changes were evident in evaluation principles and assessment methods. Some students who lost interest in learning and did not attend classes on the pretext of technical facilities struggled with their emotional experience (Omur & Sonsel, 2021). These online lessons reflect some of the shortcomings of WCIM teaching, such as the over-reliance on demonstration and imitation.

Modern musicians who aim to sustain their careers as cultural practitioners require a broad and evolving base of skills and knowledge (Bennett, 2008). Nonetheless, WCIM teaching researchers' concerns and suggestions demonstrate the shifts in WCIM teaching objectives owing to science and technology advancements (Born & Devine, 2015; López-Íñiguez & Bennett, 2020). In line with Jorgensen (2014), this genre of music concerns ideas. As such, one-to-one WCIM teaching must be rooted in and advocate powerful and critical ideas. Some scholars have proposed including instruction that develops HOTS as a possible solution (Ng et al., 2022).

The HOTS is currently considered a key competency requirement in the era of the knowledge economy (Conklin, 2011; Conklin et al., 2012; Yao, 2012; Permatasari et al., 2018). This prerequisite necessitates educational reforms in many countries or regions (Fensham & Bellocchi, 2013) and education to emphasise students' HOTS cultivation and development (Kurniawati, 2019). Hence, educational policies and developments to study HOTS have substantially influenced numerous scholars. Global HOTS studies have shown an upward trend, particularly after 2014, when relevant research was rapidly developed (Nainggolan, 2022; Liu et al., 2022). Overall, HOTS has long been considered a key predictor of success (Lee & Choi, 2017; Wei et al., 2021).

Figure 1.1

Annual Distribution of the Number of Higher Order Thinking Research Documents



Liu et al., 2022

Essentially, HOTS implies the use of critical thinking abilities to address novel challenges (Onosko & Newmann, 1994; Rajendran, 2008; Heong et al., 2011). This definition is inextricably linked to Lewis and Smith's (1993) definition of HOT. Based on Lewis and Smith (1993), HOT is activated in the form of thought processes to solve problems and make everyday decisions or when individuals encounter unfamiliar problems, uncertainties, issues, or dilemmas. This definition led to educators conceptualising teaching practices for HOTS development. The HOT constitutes a higher level of thinking with a more complex cognitive process than lower order thinking (LOT) (Miri et al., 2007; Zohar, 2013; Apino & Retnawati, 2017). For example, HOT denotes problem-solving by abstractly conceptualising, manipulating, and processing ideas rather than recalling, understanding, and applying knowledge to a specific context.

Relevant scholars have extensively examined the significance of developing HOTS. Based on existing research, HOTS enable students to promote achievement (Alsowat, 2016; Brookhart, 2010), enhance their motivation (Callaghan & Bower, 2012; Meece, 2003), build the attitudes of effective thinkers (Dungsungnoen & Shukla, 2016), and improve metacognitive skills (Parlan & Rahayu, 2021; Hamzah et al., 2022). Students of all ages and types must improve their HOTS, which may develop over time and with instruction (Sheldon & DeNardo, 2005). As not all individuals require HOT to complete a task (others may only require LOT), the conditions under which HOT is developed vary by person. (Lewis & Smith, 1993;

Newmann, 1990). Students will have to rely on background knowledge to answer a new question, thus creating a bridge between prior and new knowledge.

Current HOTS-oriented research in music has explored improvisation and composition (Wing et al., 2014), sight-reading (Siow, 2015), music education (Ng et al., 2022; Russell, 2007; Sheldon & DeNardo, 2005), band rehearsal (Woods, 2024), and instrumental music instruction (Sheldon et al., 2010), which are primary catalysts for curriculum instruction. Many researchers propose stimulating HOTS in the music classroom to better develop musical abilities (Musselwhite, 2018; Costes-Onishi & Kwek, 2022; Ng et al., 2022), facilitate talent selection (Sheldon & DeNard, 2005), hone skills (Blackwell, 2021), foster professional growth (Glazer et al., 2004; Carey et al., 2013), improve reflection (Gaunt & Westerlund, 2021), and transcend ‘perfection' (Ng et al., 2022).

Researchers have also extensively studied the pedagogy of developing HOTS. Under the constructivist learning theory, student-centric (Ichsan et al., 2019), problem-driven (Kapur & Bielaczyc, 2012; Mayasari et al., 2018; Moallem, 2019), reflective reinforcement (Dungsungnoen & Shukla, 2016; Whalen & Paez, 2021), linguistic expression (Staples & Truxaw, 2012), and scaffolding (Abdullah et al., 2021; Seibert, 2023) are key to improving HOTS in teaching. In addition to these pedagogical principles, formative assessment is a key factor.

Also known as ‘assessment for learning', formative assessment denotes any assessment that is essentially designed and practised to promote student learning, enhance instructional feedback, and modify the teaching and learning process (Carless, 2005). Other parties use denotations that specify ‘feedback' (Andersson & Palm, 2017). Thus, formative assessment differs from counterparts that serve accountability, ranking, or accreditation competencies. Researchers conceded to formative assessment being an instructional approach that improves student learning and teacher quality, which leads to higher rates of process learning (Moyo et al., 2022). This step-by-step approach depends on the type of learning tasks and thinking involved in the process (Brown & Hattie, 2009).

A significant number of researchers have come to recognise the positive significance of formative assessment in developing HOTS (Moss & Brookhart, 2019; Babináková et al., 2020; Leenknecht et al., 2021). Teachers and students who collaborate to actively and intentionally engage in formative assessment for HOTS development prioritise learning goals, determine the current work in relation to the goal, and undertake measures to attain the goal (Brookhart, 2006; Lonka, 2018; Moss & Brookhart, 2019). Formative assessment can increase student transparency (Tillema et al., 2011), reduce competency frustration, including ambiguities about tasks, standards, and methods, enhance competency satisfaction, and increase students' confidence in completing their tasks (Leenknecht et al., 2021). In other words, this assessment type establishes an active and intentional learning process that partners

teachers and students in an ongoing, systematic collection of learning evidence to optimise student learning outcomes (Moss & Brookhart, 2019; Moyo et al., 2022).

Fautley (2010, 2019b) highlighted the significance of formative assessment for music teachers, specifically in one-to-one instrumental instruction, which was the dominant model for conservatories long before the term was coined. Regardless, many studies claimed that WCIM teachers lack well-developed assessment methods and tasks that can promote students' thinking skills (Sheldon & DeNardo, 2005; Leech-Wilkinson, 2020). Furthermore, there is a researcher gap in formative assessment research addressing HOTS in one-to-one WCIM teaching.

1.3 Problem Statement

Extensive research has documented the persistent challenge of cultivating HOTS in WCIM education (Sheldon & DeNardo, 2005; Russell-Bowie, 2007; Ng et al., 2022; Costes-Onishi & Kwek, 2022). The development of HOTS is particularly crucial for WCIM learners as it fosters independent thinking and problem-solving abilities, which competencies essential for artistic interpretation and professional musicianship (Leech-Wilkinson, 2020). However, a fundamental disconnect exists between this recognized need and actual classroom practices.

Some researchers highlighted predominant teacher-centered methods in one-to-one WCIM instruction emphasize imitation over critical thinking (Carey & Grant, 2015; Holmgren, 2020), with students often merely replicating teacher demonstrations rather than engaging in meaningful cognitive processing (Costes-Onishi & Kwek, 2022). Furthermore, The absence of clear frameworks for HOTS development in one-to-one settings results in inconsistent practices (Barrett, 2014; Henley & Barton, 2022), despite evidence that structured formative assessment significantly enhances learning outcomes (Wylie & Lyon, 2015; Lyon et al., 2019). While formative assessment is widely employed (Fautley, 2010, 2019b), current implementations lack structured methodologies to effectively develop HOTS (Plastow, 2022). Teachers frequently rely on intuitive rather than systematic approaches (Berg et al., 2002; Karlsson & Juslin, 2008; Ng et al., 2022), missing opportunities to scaffold higher-order thinking. There is a research gap in formative assessment research addressing HOTS in one-to-one WCIM teaching.

This knowledge gap calls for the development of a rational framework of instructional guidance to provide teachers with guiding principles that promote students' HOTS practices in one-to-one WCIM classrooms in higher education. It has the practical implications on transforming one-to-one lessons from mechanical skill training to cognitively engaging musical mentorship that fosters independent artistry, creative problem-solving, and professional readiness in emerging musicians. Notably, the framework must be embedded in the teacher's teaching systems to establish

individualised teaching practices. Challenges in applying HOT practices to one-to-one WCIM teaching can be alleviated by addressing the immediate needs of the pedagogue and students. Expert experience must also be incorporated to logically build and assess the framework's validity. On a more basic level, despite the call for a broad focus on academic improvement of HOTS in the academic field, there is a lack of actual research surveying the needs of teachers and students. This will make it difficult to locate effective strategies for developing student HOTS in WCIM instruction. Its creates an urgent need for a comprehensive survey of the need analysis for HOTS in one-to-one WCIM instruction in higher education. This is the basis for the development of a framework for improving student HOTS.

1.4 Objective of the Study

This study aimed to develop a framework for augmenting students' HOTS practices in one-to-one WCIM classrooms in higher education. Such a framework would guide teachers to effectively promote students' HOTS about WCIM. This study defines the final product as a framework rather than a model because a framework is inherently oriented towards a set of general principles or guidelines, whereas a model is a representation or abstraction of reality (Pamplona, 2024; Carlson & Moss, 2024). Regarding research on framework construction (including framework development

studies, validation, or application), scholars agree on the appropriacy of the DDR (Type 2) method in making predictions and generating knowledge (Richey & Klein, 2004; Ellis & Levy, 2010). Multiple methods were used to support data collection and analysis in line with the different methodologies and data-gathering techniques required by each research phase. Recently, Gall and Borg's (1989) 10 steps were simplified into three key phases of needs analysis, design and development, and evaluation. The research objectives underpinning each of these stages are presented below:

Phase 1: To explore the need analysis of the HOTS and potential framework in one-to-one WCIM classrooms in higher education.

Phase 2: To develop a framework for HOTS practices in one-to-one WCIM classrooms in higher education.

Phase 3: To evaluate the internal validation of the framework in one-to-one WCIM classrooms in higher education based on expert opinions.

1.5 Research Question

This section highlights the specific questions for each phase to accomplish the research objectives.

1.5.1 Needs Analysis Phase

The first phase primarily investigated and analysis the demand for the HOTS and target framework. The central question in this phase is:

Q1. What are the needs of WCIM faculty and students for the development of HOTS and potential framework in higher education?

In this study, needs analysis entailed semi-structured interviews with 15 teachers and a survey with 538 students undergoing one-to-one WCIM teaching and learning in higher education. The objectives of this phase were attained following Hutchinson and Waters's (1987) framework for needs analysis. Two key elements, target needs and learning needs, were incorporated into this framework. The former required the inclusion of necessities, lacks, and wants, while the latter mainly explores the needs, potential and constraints of route to realisation. Hence, two sub-questions were addressed to complete the requirements analysis:

Q1a. What do WCIM teachers and students' perceptions of the target need (necessities, lacks and wants) of including students' HOTS development in one-to-one WCIM lessons in higher education?

Q1b. What do WCIM teachers and students' perceptions of the learning need (needs, potential and constraints of route) for developing students' HOTS in one-to-one WCIM lessons in higher education?

1.5.2 Design and Development Phase

Seven-expert opinions and assessments were emphasised in the second phase. The central question in this phase is:

Q2. What key components and operational mechanisms should a framework incorporate to enhance HOTS through formative assessment in one-to-one WCIM in higher education?

Specifically, five questions were addressed to achieve the framework-building goal and adopt expert viewpoints by AISM-FGD meeting to answer five sub-questions:

Q2a. Which formative assessment strategy elements should be included in the development of the framework?

Q2b. What are the relationships among the elements of the formative assessment strategies used to develop the framework?

Q2c. How should the elements of the formative assessment strategy be classified in the interpretation of the framework?

Q2d. What is the elaboration (HOTS attributes, feedback levels, clusters, and points for implementation) of each formative assessment strategy element?

Q2e. What are experts' suggestions on the use of framework in WCIM classrooms in higher education?

1.5.3 Evaluation Phase

The third phase focused on evaluating internal validation to confirm the framework's practical suitability. The central question in this phase is:

Q3. To what extent does the proposed framework demonstrate internal validity for enhancing HOTS in one-to-one WCIM higher education classrooms, as evaluated by expert assessments?

Notably, 25 expert teachers validated this framework via fuzzy Delphi method. The following sub-questions were addressed:

Q3a. What is the experts' agreement on the suitability of the strategy elements proposed in the framework for one-to-one WCIM classrooms in higher education?

Q3b. What is the experts' agreement on the classification of the strategy elements based on the five domains (Identifying problems and proposing potential solutions, (Trying to) solve problems, Reflections, Summaries, Transfers) as proposed in the framework for one-to-one WCIM classrooms in higher education?

Q3c. What the experts' agreement on the relationships among the strategy elements is as proposed in the framework for one-to-one WCIM classrooms in higher education?

Q3d. What is the experts' agreement on the list of strategy elements in the

respective four clusters (Independent, Linkage, Dependent, and Autonomous) as proposed in the framework for one-to-one WCIM classrooms in higher education?

Q3e. What is the experts' agreement on the applicability of the framework and enhancing students' practices on HOTS in one-to-one WCIM classrooms in higher education?

1.6 Scope of the Study

First, the current work solely focused on instrumental music playing based on scores rather than improvisation in WCIM teaching to narrow down the research objectives. Second, this study limited the range of HOTS that can be transferred. Despite could transferred to daily life and other fields via teaching, Bailin (1998) indicated that learning and applying HOTS require knowledge in specific fields. As this study only discussed HOTS based on WCIM learning, HOTS transference to other disciplines was not examined. Third, the present research mainly focused on one-to-one WCIM instruction in higher education. Thus, HOTS in one-to-one children or teenagers WCIM instruction was not explored very much in this research. This emphasis results from the urgent need to investigate HOTS in higher education. Meanwhile, music majors in higher education reflect a logical knowledge base to support the use of

WCIM-HOTS.

1.7 Operational Definition

The following terms are used in this study and operationally defined as follows:

1.7.1 Higher order thinking (HOT): a student's thinking process, which involves absorbing and storing new information in memory. Such knowledge is interrelated, rearranged, and extended to achieve a purpose or identify possible answers in complex WCIM learning situations.

1.7.2 Higher order thinking skills (HOTS): a type of thinking skill based on relational thinking to support HOT practices. Specific HOTS include Analyzing (C4), Evaluating (C5) and Creating (C6) in the Revised Bloom's Taxonomy (Anderson and Krathwohl, 2001)

1.7.3 Higher order thinking skills attribute: the specific HOTS content. In this study, the aforementioned attribute denotes the active verb in the upper three levels of the Revised Bloom's Taxonomy (Anderson and Krathwohl, 2001) (See Table 2.2).

1.7.4 Western classical instrumental music (WCIM): refers to the music played by classical Western instruments based on scores to respect the composer's intentions.

1.7.5 One-to-one classroom: an educational environment where a teacher only faces one student.

1.7.6 Framework: the proposed framework is a set of organised steps and procedures used by instrumental music teachers to promote students' HOTS practices in WCIM learning.

1.7.7 Formative assessment: an assessment primarily designed and practised to promote students' deep learning and HOT via collected evidence of student learning.

1.7.8 Formative assessment strategy: is a strategy used in the teaching and learning process to monitor students' learning progress in real time, provide feedback and adjust teaching methods. Formative assessment strategies were derived from 20 Strategies of Brookhart's (2010), which is an important guide for instructing students to practice HOTS in the classroom (See Table 5.2). In this study, each formative assessment strategy needed to include a clear HOTS attributes, feedback levels, clusters, and elaboration.

1.7.9 Higher Education: a concept of educational hierarchy. This study included universities, colleges, technical schools, and other college-level institutions that award degrees or professional certificates, excluding 12K and preschool.

1.8 Limitations of Study

First, all participants in WCIM teaching and learning in higher education encompassed the target study population in China only. Since 2013, China has implemented various aesthetic education reforms, which have shown excellent results in music education (Yue et al., 2023). Today, the WCIM is quite popular in China, particularly among the younger generation. The Chinese government has made classical music an important part of the country's educational policies. As a result, more than 30 million individuals are learning the piano in China, with over 200 orchestras in the Guangdong region alone (Hewett, 2022). As the number of apprentices in WCIM grows, the revenue of the Chinese musical instruments industry is expected to exceed US$10 billion in 2024, with an annual growth rate of 8.02 percent until 2028 (Statista, 2023). Thus, higher education institutes in China that offer one-to-one music education provide an acceptable background for the current study.

Second, the HOTS measures of WCIM students were not tested in this study. Feedback on HOTS levels was primarily based on individual reports and teachers' comments. As such, this study mainly aimed to augment students' HOTS practices. Future works could use a rigorous methodology to examine and measure students' HOTS growth.

Finally, this research leans more toward fundamental rather than applied research. Given the absence of experimental approaches in this study, potential scholars could perform broader quasi-experimental validation with the current framework.

1.9 Significance of Research

The significance of this study was outlined from theoretical, practical, and methodological standpoints.

On practical ground, examining HOTS instruction for WCIM teaching can promote the current expectations of WCIM teaching transformations in the academic community. This study provides empirical evidence and a guiding framework for incorporating HOTS into WCIM higher one-to-one education. Higher education

policymakers and curriculum designers should urgently prioritize the systemic integration of HOTS into music instruction in higher education. Teachers can utilise this framework to design, assess, and stimulate students' WCIM HOTS practices without undermining their own teaching system and reflect on their own knowledge system and structure. Meanwhile, WCIM-HOTS development will facilitate students to improve their WCIM knowledge construction, metacognition, and reasoning, critical thinking, reflective, and creative thinking skills to improve their interpretive skills, practice quality, performance, autonomy, and independence in WCIM learning. Such developments enable them to encounter the challenges of everyday life and their careers. Additionally, HOTS-based WCIM teaching positively contributes to the development of schools, institutions, and the music education industry.

From a theoretical viewpoint, this study is a pioneer in formative assessment of WCIM teaching that aims to bridge the knowledge gap in the HOTS field. This research offered sound theoretical support for one-to-one HOTS teaching and useful suggestions for individual WCIM-HOTS growth. Apart from providing suggestions for HOTS practice in group WCIM classrooms, the study could serve as a theoretical guide for developing technology for instrumental music classrooms (technology-enhanced formative assessment to develop classroom response systems or artificial intelligence instrumental music teaching).

In terms of methodology, this empirical work aimed to combine AISM with DDR, HOTS, and WCIM teaching and learning. This study innovatively combined AISM and FGD to prioritize key framework elements, offering valuable insights for curriculum instruction across disciplines. The methodological advancements demonstrate potential for addressing complex educational challenges and provide a robust reference for future research. Meanwhile, this study emphasized expert opinions in framework design, leveraging their deep knowledge to ensure theoretical soundness and practical viability. The iterative DDR methodology enabled continuous refinement through ongoing feedback, enhancing the framework's effectiveness and adaptability.

1.10 Summary

In summary, the development of HOTS is a cornerstone of effective pedagogy. Researchers widely acknowledge the critical role of formative assessment in fostering HOTS within classroom practices, emphasizing its impact on student achievement, instructional strategies, and curriculum design. However, there was challenges to developing student HOTS in teaching and learning in WCIM higher education. The lack of formative assessment strategies for teachers is a key. The principal conclusions emerge as follows:

1. Formative Assessment and HOTS Development in Music Education. While formative assessment is not a new concept in music education, its explicit application to cultivating HOTS remains underexplored. Despite its potential to transform learning outcomes, the integration of formative assessment strategies specifically targeting HOTS in music classrooms has not yet been thoroughly researched or systematized.

2. The Research Gap in WCIM Teaching Practices. In the context of WCIM instruction, the need to prioritize HOTS-focused formative assessment is urgent. Current WCIM teaching practices often overlook the structured development of critical thinking, analysis, and creativity—key components of HOTS. This gap persists even as evidence highlights the profound influence of HOTS on student engagement and long-term skill acquisition.

3. Study Objectives and Methodology: Building a Framework for HOTS Enhancement by DDR approach. To address this gap, this study aimed to develop a framework for augmenting HOTS in one-to-one WCIM teaching at the higher education level. By focusing on personalized, skill-driven instruction, the framework seeks to bridge the disconnect between formative assessment practices and HOTS development in music pedagogy. The study employed the Design Development Research (DDR) methodology, structured across needs analysis, design and development and evaluation.

4. Broader Implications and Applications. Beyond one-to-one teaching, this framework holds potential for adaptation in larger classroom settings, studies on

personal growth in WCIM-HOTS integration, and even research on technology-driven tools (e.g., AI) for instrumental music education. Its flexibility allows educators to prioritize critical thinking and creativity alongside technical proficiency.

Chapter 2 will provide a comprehensive review of existing literature on HOTS, formative assessment, and WCIM pedagogy. This foundation will support the framework's development and highlight its novel contributions to music education research.