

COGNITI, THE SOCRATIC AI TUTOR, AND ITS IMPACT ON STUDENT LEARNING IN
A CONSERVATORY MUSICOLOGY COURSE

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Statement of originality

This is to certify that the content of this thesis is my own work. This thesis has not been submitted for any other degree or purpose.

I certify that the intellectual content of this thesis is the product of my own work, and that all assistance received in preparing this thesis and all sources have been acknowledged.

Qiaoying Liang

Signed:

Date: 28th February 2025

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Abstract

The growing prevalence of artificial intelligence (AI) in music education, which has been employed in various domains such as music performance, music composition, music education, and music recommendation, has also raised some questions about academic integrity. In this pilot study, a Socratic AI Tutor, Cogniti, was created to assist students in a first-year undergraduate degree at the Sydney Conservatorium of Music in a unit of study called “This is Music”. Cogniti provided students with critical thinking prompts without any course-related answers. The aim of this study was to explore what happens during the conversation between students and Cogniti, and to discern how the AI tutor facilitated students’ deep learning. A mixed research method combining metadiscourse analysis and thematic analysis was used to analyse conversation transcripts and Cogniti over the five-week study period. Students also provided feedback through a questionnaire. The findings suggest that Cogniti fits well with the Socratic Method in tutoring students' learning. The results of the metadiscourse analysis show the characteristics and differences in the use of metadiscourse markers between Cogniti and the students, and the results reflect the ability to facilitate student learning in terms of language functions. Cogniti also can provide effective guidance to students that is aligned to teaching objectives and course content, and the communication process supports the development of critical thinking and promotes deep learning. Problems included a little misuse of the tool as well as mixed student engagement overall. This study highlights the potential of Cogniti to enhance music education and explores a case for the appropriate use of generative AI tutors in undergraduate music courses.

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Chapter 1: Introduction

Artificial intelligence (AI) has become one of the hottest areas of interest at present. Over the past decade, there has been a notable surge in the application of AI, particularly in education. AI-powered systems are now capable of offering students personalised learning experiences through the analysis of data and the provision of tailored feedback. The advent of Generative AI (GAI) has brought about a significant transformation in conventional teaching and learning methods, particularly with ChatGPT (Mittal, Sai & Chamola, 2024). In education, areas such as AI tutoring systems (Kuo et al., 2023; Maity & Deroy, 2024), information generation, and feedback (Gao et al., 2024) have been shown to offer significant student benefits. However, as with any phenomenon, there are advantages and disadvantages. The utilisation of GAI in an educational context has also given rise to specific concerns, such as the likelihood of plagiarism (Qadir, 2023).

While AI tools may offer suggestions or examples, it is essential to emphasise that true innovation and originality can only be achieved through one's own thinking and efforts. If students consider texts or ideas generated by AI tools as their original work, this could lead to plagiarism issues and negatively impact students' academic performance and future development (Qadir, 2023). GAI is trained on specific algorithms and databases. Consequently, the answers and solutions written to students may also be inaccurate if the AI has misleading data or faulty algorithms when providing advice or examples. It is imperative to subject the output of these AIs to rigorous scrutiny to guarantee their accuracy and reliability (Kasneci et al., 2023; Qadir, 2023). In the practice of music education, before writing this report, there have been no published research findings on the application of GAI tutors to assist undergraduate music students in their studies.

This study aims to illustrate the potential of GAI-assisted learning in an undergraduate music course. A Socratic AI tutor is designed to facilitate students' critical thinking and independent learning rather than to provide direct answers. This approach enables students to better understand lectures and assignments, enhancing their learning experience and motivation. In this study, a Socratic AI tutor (Cogniti) is employed in a compulsory unit of study named *This is Music* for first-year undergraduate students. Cogniti, initially developed by Danny Liu at the University of Sydney, is web-based software that enables educators to construct bespoke natural language chatbot agents. Such agents provide students with specific instructions and resources that are contextually relevant (Liu, 2023). It supports many features that can receive specific instructions, such as acting as a Socratic tutor or providing prompts to students without rewriting their text. Resources such as PDFs, LMS pages, and course rubrics can be provided to inform Cogniti's responses to student questions. Students may access the chatbots via a direct link or in the LMS (Canvas, in this case) as an embedded LTI tool (Liu, 2023). In this study, Cogniti is deployed as a Socratic AI tutor, providing assignment assistance to students. It aims to facilitate students' learning processes through interactive questions and feedback. For instance, guided questions, personalised feedback, and structured conversations enable students to reflect critically and self-assess their learning without providing any explicit answers to their assignments.

This study has significant implications for the use of GAI in the field of music. First, this study can contribute to the existing literature on using Socratic AI tutors in contemporary AI education. Second, the study offers empirical evidence to support the efficacy of AI interactions in fostering students' critical thinking and promoting deeper learning, specifically in relation to musicological research. This study can also inform the design and optimisation of AI teaching

tools, thus assisting educators and developers in the more effective utilisation of AI technologies to support student learning. It can furnish examples of how to deploy AI in an ethically responsible manner within the context of education while simultaneously ensuring the maintenance of academic integrity.

In order to achieve the above-mentioned objectives, the following two research questions were posed.

- How does the Socratic AI music tutor facilitate deeper learning for students?
- What happens in the communication between a student in the first-year musicology course *This is Music* and an AI tutor trained to teach Socratically?

The data collection process is divided into two distinct phases. These phases are outlined in full detail in Chapter 3 (Methodology).

PHASE 1: Data collection via Cogniti

The initial phase of data collection was conducted directly through Cogniti. All students in a first-year university musicology course called *This is Music* were given the opportunity to use Cogniti to enhance their critical thinking abilities in preparation for written assessment tasks. Prior to accessing Cogniti, students were informed that their interactions would be recorded as data for the purposes of this study and were directed to the Participant Information Statement (PIS). The use of the Cogniti platform was considered to be consent for the purposes of this study.

PHASE 2: End of Unit of Study Questionnaire

A brief questionnaire, comprising primarily of open-ended questions, was distributed via the Learning Management System (LMS) to all students enrolled in the course. The purpose of

this questionnaire was to collect feedback from students regarding their experiences with Cogniti. The questionnaire is included in Appendix D.

The research method employs a mixed method integrating qualitative and quantitative research techniques. Data gathered from student discourse with Cogniti is subjected to metadiscourse (Hyland, 2005) and thematic analysis (Braun & Clarke, 2024). The final questionnaire results are analysed to ascertain students' feedback on Cogniti.

The following is a description of the structure of this thesis:

Chapter 2 comprises a literature review, which is divided into four sections: the development and application of GAI, the practice of AI in the field of music, the current status of development and tutoring in musicology courses, and a definition of the Socratic Method for the purposes of this study.

Chapter 3 presents the methodology employed in this study. It discusses the research questions, the design of Cogniti, the research steps, data collection and analysis, and the between-methods triangulation of results.

Chapter 4 presents the findings and discussion. In the findings section, the results of the metadiscourse analysis, thematic analysis, and questionnaire are discussed separately. The results of the study are also verified in terms of the structural direction of the language, the thematic direction of the chats, and the students' feedback. The discussion section depicts the interpretation of the findings, challenges, and limitations encountered. Finally, the triangulation of the research methods is written.

Chapter 5 is the conclusion. It summarises the findings and contributions of this study, as well as some recommendations for the future.

Glossary

AIGC (Artificial Intelligence Generated Content): “AIGC uses Generative Artificial Intelligence (GAI) technology to generate content that corresponds to human instructions by interpreting intent and generating appropriate content” (Liu et al., 2024, p.1).

Deeper Learning: “Deeper learning emerges at the intersection of the following three elements: mastery, identity, and creativity” (Mehta & Fine, 2019, p.15). Deeper learning is achieved when students can develop a deep understanding of core academic content, demonstrate critical thinking and problem-solving skills, communicate and collaborate effectively, can learn independently and maintain a positive academic mindset (Mehta & Fine, 2019).

EduLLMs (Educational Large Models): “EduLLM refers to the LLM-based educational application model. By learning from a large amount of educational data and corpora, EduLLM can provide personalised learning support for students” (Gan et al., 2023, p.4776).

GAI (Generative Artificial Intelligence) refers to computational techniques that generate seemingly novel and meaningful content (e.g., text, images, or audio) from training data (Feuerriegel et al., 2024).

GANs (Generative Adversarial Networks): GANs are composed of a generator network and a discriminative network, which competes in a game, where the generator tries to generate samples as “real” as possible in order to deceive the discriminative network and the discriminative network tries its best to learn from real data and correctly distinguish between generator-generated samples and real data. This adversarial training process helps the generator learn more complex and random samples and, at the same time, improves the discriminative network's discriminative ability to better distinguish between real data and generated samples (Goodfellow et al., 2014).

GMMs (Gaussian Mixture Models): A Gaussian Mixture Model (GMM) is a probabilistic model in statistics used to describe the probability distribution of a set of data (Reynolds, 2009). Specifically, a GMM is a probability density function that describes data using a mixture of multiple Gaussian (i.e., normal) distributions. These Gaussian distributions are “components” of the model, which can be interpreted as different representations or classes of data.

HMMs (Hidden Markov Models): HMMs are statistical models for describing stochastic processes with implied state sequences. They are particularly effective at working with time series data and are widely used in various sequence modelling and pattern recognition tasks, such as speech recognition, handwriting recognition, gene sequence analysis in bioinformatics, and natural language processing (Eddy, 1996).

LLMs (Large Language Models): LLM is a large language model. It can obtain general-purpose language comprehension and generation capabilities by training billions of model parameters on large amounts of textual data (Minaee et al., 2024).

NLP (Natural Language Processing): “As an important branch of artificial intelligence (AI), natural language processing (NLP) studies the interactions between humans and computers via natural language. It studies fundamental technologies for the meaning expressions of words, phrases, sentences, and documents, and syntactic and semantic processing such as word breaking, syntactic parsers, and semantic parsing, and develops applications such as machine translation (MT), question-answering (QA), information retrieval, dialogue, text generation, and recommendation systems” (Zhou et al., 2020, p.275).

TALP (Taiwan Adaptive Learning Platform): “Taiwan Adaptive Learning Platform (TALP) is the official learning platform of the Ministry of Education (MOE) in Taiwan. A

unique feature of TALP is its use of AI to provide individual learning paths for personalised learning” (Kuo et al., 2023, p.101).

VAEs (Variational Autoencoders): VAE is a generative model for learning the latent representation of data and modelling the data distribution by generating new samples (Girin et al., 2020). The core idea of VAE is to incorporate latent vector encoding (latent representation) as a parameter into the model and minimise the reconstruction. In this way, the VAE can generate new samples and learn the intrinsic representation of the data. This model is widely used in deep learning to generate and learn the representation of different types of data, such as images and text.

Chapter 2: Literature Review

GAI Systems

Introduction

Generative Artificial Intelligence (GAI) is a computational technology that can be trained to generate text, images, audio, and other forms of data based on deep learning models trained on double data (Feuerriegel et al., 2024). These resources are often two different sources or types of data combined to help AI reduce bias. In essence, any dataset that can be collected and prepared for processing can be captured and learned by GAI to perform any task one can think of and provide feedback in the form of text, images, or other media based on instructions. A well-known example is ChatGPT. Artificial Intelligence Generated Content (AIGC) refers to the replacement of human-authored content with automatically generated content using GAI technology with a quick response time (Cao et al., 2023). This content is efficient, short-lived, and contextually automated feedback. The generation of content by AI is typically dependent upon the availability of a substantial quantity of training data and the capacity of deep learning models to discern underlying patterns and regularities. The quality of the generated content is contingent upon the complexity of the model, the quality and quantity of the training data, and the constraints of the generation task. The outputs could be, for example, text, images, and music.

Models of GAI

The advent of models for AI, including Hidden Markov Models (HMMs) (Baum et al., 1970) and Gaussian Mixture Models (GMMs) (Reynolds, 2009), can be traced back to the 1950s. These models were initially employed to model probability distributions and perform pattern

recognition statistics. The former is employed in the modelling of time series, such as speech recognition and handwriting recognition, while the latter is utilised in a multitude of image-processing applications. These are the most representative prototypes. With the advent of recurrent neural networks in the 2000s (Mikolov et al., 2021), which were developed to address relatively long natural language processing (NLP) problems, GAI began to garner attention. GAI models can be broadly classified into several categories: Generative Adversarial Networks (GANs), Variational Autoencoders (VAEs), and Transformers. Explanations of each model are given below.

In 2014, Goodfellow et al. proposed a deep generative model framework for Generative Adversarial Networks (GANs). The framework consists of two adversarial models: a generator (which generates new data) and a discriminator (which distinguishes between real data and computer-generated data by learning complex high-dimensional distributions of images, audio, and data). The generator and discriminator compete, with the generator trying to generate samples that are similar to the trained data distribution, while the discriminator takes the received samples and tries to differentiate between recognizing which are real samples and which are generated samples (Saxena & Cao, 2021). GANs have been successfully applied to a multitude of fields, including image generation, video generation, domain adaptation, and image super-resolution (Saxena & Cao, 2021). Examples are StyleGAN, which can generate very realistic virtual faces (Karras et al., 2019). The capabilities of image generation control and the quality of generated images, as well as the introduction of new dynamics to GAI, have had profound influences on the GAI field. Examples include DALL-E, developed by OpenAI (Zhou & Nabus, 2023). An image-generation model based on GPT-3 can generate images ranging from simple to complex and even never-before-seen and very creative images.

Variational Autoencoders (VAEs) are defined as a neural network model for learning a low-dimensional representation of input data (Kingma & Welling, 2019). This process is accomplished by the interconnection of two encoders and decoders, which are connected primarily by means of a set of latent variables. For example, after training on many images of people's faces in practice, VAE can generate a variety of new faces that do not appear in the data but match the features of a given face. These models of unsupervised learning operate by compressing the dataset, thus ensuring that the inputs and outputs are as identical as possible. The entire system is trained through optimisation algorithms such as gradient descent, which generates new data by feeding a random set to the decoder, allowing the decoder to accurately reconstruct the input data and latent representations to capture key features of the data (Kingma & Welling, 2019). The model is frequently employed in image generation, anomaly detection, and natural language processing. For example, Face VAE (Sun et al., 2022) can generate face images with different expressions, genders, ages, and other features by learning potential representations of many face images.

Transformer models, including the GPT (Brown et al., 2020) and BERT (Devlin et al., 2018) families, have made remarkable achievements in natural language processing in the last five years. These systems employ self-attention mechanisms to process and analyse data sequences, enabling them to recognise connections between words in whole chapters or books. This makes them suitable for training on large-scale and unlabelled datasets (Khan et al., 2022). ChatGPT represents a powerful Transformer model, which, along with other GAI models, is a representative class of Artificial Intelligence Generated Content (AIGC). Like other GAI models, ChatGPT represents a category for creating more humanized content through AI modelling (Cao et al., 2023).

Large Language Models

The field of Large Language Models (LLMs) constitutes a subfield of GAI that is focused on the processing and generation of natural language. LLMs in this field represent a class of GAI systems that can solve problems expressed in language processing or responding to a variety of cueing tasks. These language models are trained explicitly by multilayer neural networks using data collected from the Internet. LLMs are powerful deep-learning tools for handling various natural language processing (NLP) tasks. The objective models admire and understand language's underlying patterns and rules by training on large-scale corpora (Gan et al., 2023). LLMs achieve this primarily by applying linguistic principles and rules to understand context and generate semantically rich and grammatically correct responses (Baidoo-Anu & Ansah, 2023). LLMs are the best choice for users who require outputs with critical information, given that LLMs perform well in handling a variety of applications, including generalised natural language tasks and domain-specific tasks (Chang et al., 2023). Examples of LLM popularity are Claude (An AI language model developed by Anthropic), Genimi (An AI language model developed by Google DeepMind), GPT (An AI model developed by OpenAI), and so on. Regarding the difference between GAI and LLMs, GAI is a much broader concept with techniques that deal with text generation, image generation, and so on. But LLMs focus on natural language processing. GPT-3/GPT-4 is a prime example of AI-generated by LLMs, which has gained attention for its power. The major models, such as GPT-3/GPT-4, use the Transformer as one of their core architectures, and these models are trained to produce applications such as ChatGPT.

The development of advantages and disadvantages of ChatGPT have also been widely discussed. ChatGPT is a model based on a large-scale self-supervised learning approach. It is a

language model that can answer and generate content in response to a user's question or conversation by pre-training on a large amount of Internet text. ChatGPT can be used for a variety of applications, such as intelligent customer service, chatbots, language processing, and so on. It has many language comprehension and generation capabilities and can automatically handle a variety of common problems and tasks based on relevant language models (Kalla & Smith, 2023). These transformers are designed to process sequential natural language text and then generate coherent and human-like outputs. In current research on ChatGPT in education, several studies have confirmed the success of AI, including Natural Language Processing (NLP), language translation, text generation, and question-answering (Kasneci et al., 2023). ChatGPT is pre-trained on a vast quantity of data, yet it is evident that ChatGPT is not self-aware (Kalla & Smith, 2023). However, a substantial amount of web data used to train LLMs is believed to produce linguistic texts with human subjectivity. It is necessary to ascertain whether ChatGPT can recognise and avoid this subjective discrimination when performing natural language processing tasks. Relevant studies, such as Machine Psychology, posit that each new word generated by ChatGPT is based on a previous sequence of words and that iteratively determining the response through questioning can improve the results to some extent (Chen et al., 2023). Based on this idea, it is worth investigating whether an iterative interaction approach can assist ChatGPT in addressing any bias in the training data. Both Brown et al. (2020) and Wu et al. (2023) have published some test results for ChatGPT. However, it is unclear whether training based on a limited database and using predetermined answers based on user questions can also be error-prone due to the inability to determine the exact training database and training size.

The successful application of ChatGPT in academic research (Sánchez-Ruiz et al., 2023) has demonstrated that it is a powerful resource for data analysis and interpretation (Wu et al.,

2023). It employs deep learning techniques and uses a substantial amount of data to perform tasks. The system can handle a multitude of language comprehension and generation tasks, including multilingual machine translation, code debugging, story writing, error correction, and rejecting inappropriate requests (Wu et al., 2023). It offers learners the opportunity to enhance their comprehension of intricate problems and to develop effective solutions. For example, ChatGPT is able to break down complex music theory content, making it a good helper if students have difficulty understanding it. Apart from these case studies, ChatGPT in education can also help provide personalised feedback and support to students (Malik et al., 2023), interactive assessments (Tlili et al., 2023) and help students with coding and hyperparameter explanations in data science courses (Zheng et al., 2023). However, ChatGPT has also raised concerns in terms of education law, such as the possibility of deliberate or accidental plagiarism or cheating (Rejeb et al., 2024; Tlili et al., 2023), which can challenge academic integrity.

LLMs in Education

LLMs are widely used in education. The continuous development of Educational Large Models (EduLLMs) provides new ways to enable AI personalised learning approaches, AI tutoring for assignments, and AI educational assessment to improve the learning experience (Gan et al., 2023). As a result, there are numerous research cases on the integration of LLMs into education. Drawing upon early case studies of LLMs, the following aspects of the use of LLMs in education can be found.

LLMs Applied to the Adaptive System

The research on adaptive learning systems dates to the 1990s. It was created to solve static text problems in different domains and thus apply dynamic text to adapt to the individual needs of users (Böcker et al., 1990). Examples of adaptive learning platforms can be found in

recent research outputs, which examine the use of LLMs to create personalized learning experiences for students. In the case of adaptive learning using technology, Xiao et al. (2018) proposed a personalised recommendation system for online course learners. The system recommended relevant courses and other learning resources to learners enrolled in formal online courses, improving the efficiency of students' independent learning. Bhaskaran and Santhi (2019) used a hybrid recommendation strategy proposed by the ApriorAll algorithm to achieve personalised recommendations for learners based on their browsing logs, behaviours, and preferences. Kuo et al. (2023) investigated the feasibility of integrating LLMs into the Taiwan Adaptive Learning Platform (TALP) to enhance its existing adaptive mechanisms and improve students' learning experiences. Personalised course recommendation systems based on LLMs are also widely used in online and big data education. These personalised learning recommendation systems, which are based on LLMs, provide customised options for student learning. Similarly, ChatGPT, as a representative of LLMs, has been implemented in many practices related to adaptive teaching and learning. For instance, Kabir and Lin (2023) utilised ChatGPT to generate questions and offer feedback to students on their answers. They also created a prompt generator and text parser to facilitate adaptive learning through ChatGPT. These examples demonstrate that AI tools developed from LLMs have a beneficial impact on adapting to students' individualised needs.

Intelligent Tutoring Systems that Support Personalised Interaction

LLMs can be utilised as the foundation of a personalised tutoring system, offering tailored tutoring in various subjects, clarifying intricate concepts, and aiding students in comprehending challenging problems. Such tutoring systems can adapt the content of the tutoring to the individual needs and performance of each student.

Personalised learning refers to a range of learning experiences, instructional methods, educational programs, and systematic academic strategies designed to meet individual learning needs (Akyuz, 2020). ChatGPT can provide tailored and interactive help to self-directed learners by customising its advice and responses to each learner's choices and goals (Elbanna & Armstrong, 2024; Gill et al., 2024; Firat, 2023). Cheung et al. (2003) designed a Smart Tutor system for distance learning in Hong Kong. Their study demonstrated that the Smart Tutor's integration of online resources and provision of specific advice to students could help adult learners. Akyuz (2020) studied the use of intelligent tutoring systems and found that students' academic performance and willingness to learn improved. The use of LLMs, specifically GPT-4, in teaching English as a foreign language (EFL) has been shown to facilitate interactive and personalised learning experiences. Baskara (2023) incorporated LLMs into EFL teaching and found that students responded positively. ChatGPT, a type of LLM, can assist all learners and allows for discussion and debate about explanations, solutions, and suggestions. Learners can receive interactive assistance from ChatGPT at any time and from any location as long as they have an internet connection (Rahman & Watanobe, 2023). The studies show that intelligent tutoring systems have a positive impact on providing accurate, personalised, and effective tutoring to students. However, it is worth noting that the flexibility of AI and how accurately it meets the needs of each student (and from time to time may mislead them) remains unresolved (Kooli, 2023).

Automated Assessment and Feedback

LLM breakthroughs have also enabled automated rapid assessment and feedback in education (Gao et al., 2024). For example, AI assessments can automatically evaluate the academic performance and progress of students. Samarakou et al. (2016) showed that AI is able

to provide personalised feedback and assess grades, while Qi et al. (2023) developed an intelligent learning assistant to help learning by providing advice, plans, and templates for struggling students. Recent studies, such as the experiments by Alshewiter et al. (2024), further validate the effectiveness of AI-based assessment frameworks and automated feedback systems in helping self-employed Jordanian undergraduate foreign language learners to become proficient in a foreign language. These studies show that AI has great potential to provide personalised feedback, assessment scores and learning support that can help improve learning outcomes and students' language learning experience. Although there is evidence supporting the use of automated AI assessment and feedback for efficient, immediate, and standardised evaluation, there are still significant challenges associated with AI, particularly in measuring human cognitive and affective factors (Yang et al., 2023).

Summary and Gap

Overall, the examples mentioned above confirm the advantages of AI learning models implemented based on LLMs, such as personalised learning, automatic feedback, interactive guidance, homework tutoring, and intelligent teaching materials. All of the cited studies show that researchers are exploring the most appropriate ways to use AI in education. Yet there are also some concerns raised about the use of AI for learning. It is important to explore how LLMs can be used in learning to promote critical thinking and motivate students to achieve deeper learning (defined in the glossary) instead of simply giving students answers. An AI learning assistant created using an LLM may provide students with too many answers, and students may become lazy by relying on its answers, which in turn may hinder the development of critical thinking and study skills (Sok & Heng, 2024). Additionally, and as mentioned, there are concerns regarding academic integrity, ethics, and learning outcomes, as AIs are easily available

to students and offer powerful search and database capabilities (Alser & Waisberg, 2023; Kasneci et al., 2023).

AI in Music-Related Fields

AI makes music creation more personalised, precise, and efficient through technologies such as deeper learning and natural language processing. In this section, I will describe several ways in which AI has been studied in the areas of performance and composition, education, music distribution and recommendation, and improving people's musical experiences.

AI in Music Performance and Composition

In music performance, AI robots have been created to perform with humans (Eguchi, Gerardo & Twomey, 2024; Saffiotti et al., 2020). It is not always possible to distinguish between art created by AI and art created by humans (Ansani et al., 2025). In the case of classical music performance, professional musicians are also unable to distinguish between performances created by algorithms and human performances (Schubert et al., 2017). This may indicate that, in some specific cases, AI performances are already comparable to those of traditional musicians.

In music composition, there has been a significant increase in interest among musicians and computer scientists in automated music generation based on artificial intelligence (Civit et al., 2022). Through techniques such as deep learning and natural language processing, AI is able to learn and generate new music from vast amounts of music data. Such as Google Megenta (Schreiber et al., 2024). The user can enter a melodic fragment on which the system can generate musical compositions of different styles and structures. Another related music production tool, Ableton Live (Hein, 2021), can also be powered by AI to create music. At the same time, computer scientists are committed to developing more advanced algorithms and models to

improve the accuracy and diversity of automatic music generation so that it can better meet the needs of different users.

Numerous studies have shown that GAI allows people to create through generative language, images, and other media. This is also true in music domains such as music composition, interactive learning, music collaboration, and music in virtual reality. AI can generate music. In recent years, there has been an expanding trend in the use of AI in music composition and collaboration. For example, Frid et al. (2020) developed a user interface that allows users to input songs into an AI engine, which then generates and mixes the music by AI. Suh et al. (2021) showed that AI could be used as a tool for amateur musicians to help them enhance their creativity in the creation of community music. These innovative applications demonstrate the great potential of AI in music composition, collaboration, and creative support.

Another example widely used in music generation is Suno, which uses GAI techniques to create a multimodal music platform supporting lyric generation, speech synthesis and music generation (Yu et al., 2024), which has changed the way people create music by offering artists more opportunities for serendipitous discovery than MIDI tools (Fox, Vaidyanathan & Breese, 2024). GAI techniques used in music composition may involve the uncertain territory of unauthorised data scraping and AI model training on copyrighted music, which may raise legal and copyright issues (Fenwick & Jurcys, 2023; Lucchi, 2024). For example, Suno has faced copyright litigation.

The previous examples illustrate how research in the field of GAI used in relation to music performance and composition has both advantages and disadvantages. GAI music has indeed ushered in a new era of music creation. However, issues such as copyright in the future of AI music creation are also worth thinking about.

AI in Music Education

Early examples of AI-assisted music teaching started with pre-stored ear-training systems and then slowly branched out into training that could be adjusted for difficulty (Holland, 2013). Currently, in the field of music learning, AI can provide personalised learning paths based on student's learning needs and can be used as an auxiliary tool to help music creators generate music materials and synthesise music works. In teaching practice, AI can help realise virtual recital rooms, simulate the playing experience of different instruments to help students improve their instrumental skills (Yang, 2020), and help realise personalised feedback and evaluation (Sánchez-Ruiz et al., 2023).

Previous examples from other disciplines have shown that students view the personalisation of questions and detailed guidance provided by GAI as a key advantage over other AI model types (Sánchez-Ruiz et al., 2023). This is due to its ability to provide precise user-centred guidance without any question constraints. Music is a complex field, and many musical problems cannot be easily categorised as good or bad or any other binary or multiple-choice answer. Therefore, solving musical problems is more challenging than those that can be addressed by a typical Intelligent Tutoring System. It is evident that GAI is more effective in solving a wide range of music problems than an Intelligent Tutoring System for instructing music majors with single or multiple problems.

Artificial intelligence also facilitates the learning of music theory and listening (Merchán Sánchez-Jara et al., 2024). In current examples, the integration of artificial intelligence in music education includes *VIP Training*, an AI-based online tutoring software that assists students in correcting inaccurate intonation by identifying the sounds of musical instruments online (Yang, 2020). *Ear Master* is another AI software package that helps students train their ears on pitches,

chords, melodies, rhythm, and other musical elements for auditory recognition (Apaydinli, 2020). There is currently a lack of examples of GAI being applied to musicological learning. However, GAI can be used in music education in conjunction with digital technologies, with relevant examples such as Ableton Live facilitating professional learning for secondary school music teachers (Emo, 2021).

It is important to note that while music works often convey emotional content, there are established methods for describing that content and objective methods for analysing it. It is expected that the current GAI models, like ChatGPT, may not adequately recognise intonation and emotional content (Kalla & Smith, 2023). Therefore, it is necessary to consider training AI with human perceptual understanding to improve its ability to solve music-related problems in a more human-like manner.

AI in Music Recommendation and Facilitation of the Music Experience

Artificial intelligence has also excelled in music recommendation. Based on big data and machine learning technology, AI can push music according to users' preferences and behaviours (Anand et al., 2021). This kind of personalised recommendation can not only improve the efficiency of music distribution but also improve user satisfaction and experience. In traditional music recommendation systems, the system recommends songs for users based on their behavioural data (ratings, favourites, and so on) and some charts. However, the emotional factor (emotional experience or impact of the music listened to) is not considered. In order to increase the user experience, some emotion-based AI music systems have been trained to recognise and match songs to users according to their emotions (Parag, Sakshi & Suman Sen, 2024; Sharm, Vishwakarma & Mathew, 2024). There are also learned concerns about the ethical issues that may arise from the use of AI music recommendation systems (Chen & Steven, 2021).

Murindanyi et al. (2023) considered the development of a responsible artificial music recommendation system, which can accurately categorise music by extracting different features from the music for the purpose of accurate recommendation.

AI plays an important role in the music experience. The development of virtual reality (VR) and augmented reality (AR) technologies could allow users to be more immersed in the music environment and feel a richer music experience. Wang and Yu (2025) discussed the spatial elements in computerised music production based on VR technology. They argued that VR technology can build a virtual music space that can simulate the most realistic state so that everyone can feel the structure of the music space. Yan and Xia (2024) helped improve student learning and learning experiences by applying VR and AI technology to an interactive audio-visual course teaching process.

Summary

Overall, the research described above demonstrates the effectiveness of AI in various aspects of music performance and composition in the field of education, music recommendation, and enhancing the music experience. What can be discerned is that the potential benefits of AI are clear. However, there are several risks and ethical issues that need to be further addressed in the use of AI for human intervention. Particularly in solving music-related problems, which often involve aesthetic and uncertain answers, the use of AI in music education may be flawed. Artificial intelligence technology is better at solving non-musical problems and pedagogical issues. In order to solve personalised problems in music, it is necessary to explore the potential of AI technologies for teaching and learning.

Musicology and Tutoring

Musicology is the academic and scientific study of music (Britannica, 2020). The term musicology literally means “the study of music” and encompasses all aspects of music from all cultures and all periods of history (American Musicological Society, 2023). Musicology has never been a simple term for the study of music. When people talk about musicology, the discussion and the definitions of musicology vary widely from one person to another. Thus, the research of musicology is also different due to geographical, cultural, and philosophical differences. The American Musicological Society in 1955 defined musicology as the field of knowledge that has as its object the study of the art of music as a physical, psychological, aesthetic, and cultural phenomenon (Vincent & Hagg, 2001). This gives musicology an extremely broad scope of study.

History of Musicology

Music has a long history of development all over the world. When people talk about music, they often note the practice of music theory as early as the ancient Greek and Roman periods, such as the Pythagorean school of numbers as the basis of music (Duckles et al., 2020). In many places around the world, music was associated with numbers and human society and was considered a sacred art closely related to religion, philosophy, and education. The term musicology specifically did not appear until the 19th century. Chrysander (1863) introduced the view of music as a fundamental discipline, which is considered to be the earliest proposal for the establishment of the discipline of music.

Broadly speaking, the discipline of musicology can be divided into two major categories. The first category is academic musicology, which studies the theory, history and culture, social psychology, and other aspects of music, such as music history, music psychology, music

aesthetics, or ethnomusicology (Cook & Everist, 1999). The other category is practical musicology, which aims to explore music's performance, creation, and education. For example, music education, music performance, and music composition (Cook & Everist, 1999). Another categorisation divides musicology into historical musicology and systematic musicology. Duckles et al. (2020) describe historical musicology as the history of music in all areas of time, peoples, nations, and individuals. It focuses on the development of music for various categorisations, such as the development and evolution of music and the artistic careers of composers and their impact on society, among others. The other branch, systematic musicology (Duckles et al., 2020), is defined as the concern with the laws of composition and performance in all branches of music, such as rhythm, melody, harmony, music education, music aesthetics, music psychology, ethnomusicology, and so on. Its field of study involves the creation, performance, and education of music, which is highly relevant to the human expression of emotions.

There are many classifications of musicology other than the above dominant ones. Kerman (2009) describes traditional musicology as tending to be factual, documentary, verifiable, analytical, and positivist, focusing primarily on regularised musical texts such as genealogy, repertoire studies and transcription work, and music bibliography. His view of traditional musicology was that it prioritised facts and documentation over understanding the aesthetic experience and significance of music. The many terms associated with musicology reveal the complexity and diversity of the field of musical studies. Scholars continue to diversify their thinking and research perspectives on musicology.

Toward the end of the 20th century, musicology experienced a period of flourishing and diversified research perspectives. One such perspective is ethnomusicology, which views music

as a cultural phenomenon that must be understood within a specific cultural context (Merriam, 1976). This perspective recognises music as a product of human creation, an integral part of human cultural life, and subject to socio-cultural influences that shape its meaning and function. Another field is music aesthetics, which aims to explore the relationship between music and other musical expressions, the aesthetics of music, and how people appreciate music. The main representative is Levinson, who developed music aesthetics from a psychological point of view in his work (2011). The growth of digital music and diverse musical concepts have created challenges for the development of musicology, for example, critical musicology and postmodernist musicological studies under the critique and reflection of traditional musicology.

In 1986, Kerman critiqued traditional musicology, which he said focused solely on analysing musical works and rules while disregarding the meaning and emotion behind the works themselves. The research perspective of this work emphasises the socio-cultural significance of musical works and their emotional impact on listeners. This challenges the traditional musicological paradigm and contributes to changes in the field of musicological research. Postmodernist musicology (Taruskin, 2008) recognises the diversity, variability, and relativity of music. His quote, “Everybody feels oppressed during a Wagner performance. That is part of the appeal” (Taruskin, 2008, p.138), expresses a unique understanding of the music. Its research perspective opposes tradition and authority and rejects the centrism of single music. Postmodernist musicology argues that knowledge is not based on a fixed, universal foundation but is constructed by factors such as language and ideology (Kramer, 1992). This perspective brings a more open and pluralistic direction to musicology.

Changes in technology have also altered the concept of musicological research not only in thinking but also in reality. Digital technology has made it easier for musicologists to manage

and store large amounts of music materials (Abdallah et al., 2017). However, they also need to face the challenges of managing and protecting digital materials (Weigl et al., 2021). Advances in computer software and digital tools have provided new avenues for music analysis (Coupric, 2023), and musicologists need to adapt to and master these tools. MuseNet by OpenAI, for example, generates music and performs automated stylistic analysis (Sexton, 2023).

Music Tutoring

Music teaching has changed significantly in many ways over the last few decades. As society has evolved, so have people's needs and expectations of music. It is recognised that music plays an important role in emotional regulation as well as the development of individuals (Hallam, 2010). People who study music are more likely to succeed in formal education (Gojmerac, 2018). All of this evidence shows that music is becoming increasingly valued.

Through systematic study and practice, students can gradually master the basic elements of music, laying a solid foundation for subsequent music composition and performance. With the development of technology, intelligent tutoring systems are gradually being used for tutoring music learning. Examples of such methods are intelligent tutoring (Della, 2023; Holland et al., 2011). Artificial intelligence tutoring tools can provide tailored learning advice by analysing data to understand students' weaknesses in musicology learning.

The System of Musicology Tutoring in a Specific Area

There are many different systems of music learning, and the Asian system of music education is described here as an example. The diversity of both local and Western music characterises Musicology in Asia. It includes the study of traditional music of Asian countries, the study of Western music systems, and the study of the localisation of Western music. In China, the development of music has a history of several thousand years, from the discovery of

the bone flute in Jiahu Lake more than 7,000 years ago, suggesting that China already had a relatively accurate seven-tone scale system (Liu, 2006). For thousands of years afterwards, some forms of music that were designed to preserve the rule of the feudal dynasty developed rapidly, such as the fusion of song, dance, and music during the Xia, Shang, and Zhou dynasties and then to the development of court music, and the prosperity of the public's music (Zheng, 2008). In the 19th century, when Western musical ideas were introduced, the phenomenon of the co-existence of the Western and Chinese music in the music of China was formed (Wang, 2014). The discipline of musicology was first established in China in the 1950s, with a famous Western music researcher Wang Guangqi in China as the pioneer of the music discipline for the first time in the Central Conservatory of Music (Liu, 2006).

The current Chinese musicological system is a broad academic discipline that encompasses the study of all aspects of music using various approaches from the natural sciences, humanities, and social sciences (Yu, 2004). It includes the study of finished musical products and musical behaviours throughout human history and the present day. Music preservation is primarily oral, with only a small portion being stored in written form, such as musical scores, pictorial materials, and written records. As a result, musicology encompasses a wide range of directions in music organisations. Musicology is the upper level of many secondary sub-disciplines, including music history, music archaeology, music documentation, music iconography, music acoustics, instrumentation, music anthropology, ethnomusicology, and music folklore.

In addition, in the field of music creation, musicology has spawned many secondary disciplines, such as music physiology, music aesthetics, music psychology, music sociology, music pedagogy, and ethnomusicology (Yang, 2011). In the fields of performance and

composition, musicology has given rise to specialties such as composition, vocal performance, piano performance, and instrumental performance. More precisely, musicology is a parent discipline and collection of these fields. In the discipline design for bachelor's music students, musicology is a broad discipline. It is the primary level of the major discipline of music offered by Chinese comprehensive universities and professional music colleges. Musicology is a popular undergraduate program in Chinese higher education institutions (Yang, 2011). Although musicology as a discipline in China encompasses many research and performance orientations, the major is a common choice among students. In a typical curricular situation, each university can appropriately adjust the course of instruction according to its training requirements. However, regardless of the specific focus, the teaching method plays a crucial role in guiding students' learning. The Socratic Method is particularly effective in encouraging students to think critically and learn deeply.

Defining the Socratic Method

An AI Socratic tutor, *Cogniti*, is employed in *This is Music* (See the section on Methodology and Appendix G for more details on this unit of study) to help students develop critical thinking toward assessment tasks and other key learning outcomes. Most contemporary educators are familiar with the term “the Socratic Method” and might use it in their practice, but in this study, I attempt to investigate whether and how the discussions between the AI and humans were actually “Socratic” in nature, as well as whether this had the desired effects with the students. Therefore, it is essential to define the Socratic method precisely in order to inform later analysis.

Introduction and Historical Background

The term “Socratic Method” is sometimes associated with images of teachers administering challenging training quizzes to their students, with the students visibly uneasy and hesitant to contribute. However, this method is also often characterised by gentleness, patience, and humour and has been shown to be conducive to a productive learning environment (Dillon, 2016). The Socratic Method originated from the teaching of Socrates, a famous philosopher and educator during the ancient Greek period (Knezic et al., 2010). His teaching emphasised the cultivation of self-conscious thinkers. Famously, as Socrates did not leave any written works of his own, his ideas and methods were recorded mainly through his student Plato and other later philosophers. Socratic conversations first appeared in Plato’s writings, such as reproducing the atmosphere of Socratic teaching in the *Phaedrus* Apology (Hackforth, 1972).

Heuristics developed from the Socratic Method during the Renaissance have since become a fundamental teaching method in many national law schools (Christie, 2010). The Socratic Method aims to cultivate students’ independent thinking and a sceptical and critical spirit, enable them to think deeply about various issues, and thus improve their analytical and problem-solving ability, significantly promoting innovative talents. The Renaissance saw a huge renewed interest in Plato and Socrates with the rediscovery of ancient Greek and Roman thought, particularly classical philosophy, which re-entered the academic and cultural life of Europe during this period (Hankins, 2005). Educators and philosophers began to emphasise acquiring knowledge through critical thinking and questioning traditional authority, which attracted much attention and discussion at the time.

Modern Definitions of the Socratic Method

The Socratic Method is considered a teaching method that guides thinking and learning through questioning and conversation. The role of the Socratic teacher is to stimulate conversation, encouraging learners to explore a given topic by asking thought-provoking questions, creating contradictions by presenting counterexamples and avoiding giving their own opinions or answers (Tikva, 2010).

Paul and Elder (2007) and Rabois (2016) highlight the important role of the Socratic Method of questioning in promoting students' critical thinking skills. Paul and Elder suggested that this method helps students achieve deeper learning through systematic thought processes and questioning. Rabois, on the other hand, combined the Socratic Method with creativity and empathy, exploring how shifting teaching strategies can design lessons that both stimulate critical thinking and foster emotional understanding.

The Socratic Method is dialogical, which emphasises the interaction between teacher and student, conflict, and guidance of thinking by means of cross-examination, hypothesis, and guidance to challenge the central point (Davies & Sinclair, 2014).

Classification of the Socratic Method

The previous section introduced some definitions of the Socratic Method, and the following section is about the detailed classification of the Socratic Method. Several scholars have discussed the categorisation of the Socratic Method of teaching. Maxwell (2013) argues that there are two types of Socratic teaching methods. One is the classical Socratic Method of teaching. The other is the modern Socratic Method of teaching. The former refers to the Socratic Method of teaching recorded in Plato's writings that have been handed down to us, a method that favours solving specific problems over complex and advanced dilemmas and guiding people

from ignorance to knowledge. The modern Socratic Method of teaching has its origins in Plato's dialogues, which employ a step-by-step questioning approach to facilitate the acquisition of knowledge. This process can be conceptualised as moving from knowing to recognising (i.e., developing the capacity for critical thinking). Matthews has a detailed method of delineating the Socratic Method. Matthews also argues that two distinct Socratic Methods exist. The first is the method commonly referred to as the "Socratic Method", which guides the student's thinking primarily through the use of questions rather than direct answers (Matthews, 2022). The second method is the "Socratic elenchus", a method of philosophical inquiry exemplified in early Platonic dialogues such as Euthyphro and Lachesis. This method entails cross-examination, wherein the examiner (Socrates) asserts ignorance regarding the nature of a specific virtue while seeking to ascertain it (Matthews, 2022). The primary distinction between these two approaches is that the questioner in the "Socratic elenchus" does not assert a comprehensive understanding of the subject matter, whereas the "Socratic Method" is predicated on the assumption that the questioner possesses a certain degree of expertise. The first of these is a method that is commonly employed in the field of pedagogy. The fundamental premise of this pedagogical approach is that educators must facilitate learners' capacity for critical thinking and enhance their depth of understanding by posing thought-provoking questions. The questions presented here are not designed to yield a definitive answer; instead, they are employed as a pedagogical tool to stimulate and guide cognitive processes, enabling learners to engage actively with ideas and thoughts, analyse and evaluate them, and develop their critical thinking abilities. Cogniti is designed to stimulate critical thinking in students based on this second approach. It assumes that students own their knowledge and simply ask questions to promote self-reflection and develop it.

Development and Application of the Socratic Method

The Socratic Method, as practised in contemporary teaching and learning, was developed in the 20th century. Teachers were increasingly interested in teaching critical thinking, and so interest in the Socratic Method began to flourish once more. As previously discussed, the Socratic Method has changed dramatically in modern times: from the initial aim of helping people to recognise “ignorance,” it now places greater emphasis on critical thinking, independent learning, and self-reflection to develop students’ ability to think independently and analyse problems (Maxwell, 2013). The Socratic Method is praised and respected for its intellectual rigour in developing students’ critical and analytical thinking (Abrams, 2015). Representatives of that period, such as Vlastos (1993), examined how Socrates’ elenchus could be used to search for truth. In his book *How we think* (1910), Dewey mentioned that education is not only about imparting knowledge but also about developing students’ thinking skills and scientific attitudes. According to Dewey, the role of the teacher is to stimulate and develop the students’ inner thinking ability, not just to instil knowledge (Dewey, 2022). His philosophy is entirely similar to the pedagogical goals of the Socratic Method now used in education, which favours the development of student’s abilities and focuses on the development of thinking. “Thinking is not ‘single’ and ‘unchangeable’ but rather a combination of modalities that emphasises the teacher’s understanding of individual differences in student thinking” (Dewey, 2022, p. 38).

Application and Challenges of the Socratic Method

Today, the Socratic Method is widely used at all levels of education and in various disciplines from primary to higher education (Dalim et al., 2022). For example, English language learning (Jensen, 2015), pharmacy learning (Kinney, 2022), and law learning (Grant, 2016). In order to adapt to teaching styles in the age of technology and to better meet the learning needs of

their students, teachers are encouraged to adopt new technologies for teaching (Fuller, 2023).

Recent references to the integration of the Socratic Method and technology have also been widely mentioned. Examples of technology as an important medium for the application of the Socratic Method and promoting critical thinking include distance learning technologies (Tucker, 2010), E-learning 2.0 (Page, 2014), and web-based collaborative learning (Lee et al., 2014).

These technological developments also require educators to conceptually change their worldview of education. Humberstone et al. (2020) and Humberstone et al. (2024) use an approach that stimulates critical thinking in an attempt to stimulate the worldview of music educators to promote change in teaching and learning. The Socratic method of teaching is similar and is constantly being used with new technology. Whether through distance learning technologies, E-learning platforms, or online collaboration, it has been effective in guiding students toward critical thinking and deeper learning while adapting to the demands of modern educational technologies.

The questioning of goals, questions, information, inferences, concepts, assumptions, consequences, and perspectives helps people to evaluate their thinking and have conversations more effectively. This is an excellent guide to the modern Socratic method of teaching in all disciplines of education. According to Matthews, by asking questions, the Socratic Method allows teachers to guide students to think about different aspects of a problem and encourages them to question and analyse their own views. This method helps students develop the ability to think independently rather than simply accepting information (Shea, 2022). In teaching the Socratic Method, how teachers go about guiding the students is important, and the teacher's flexible guidance can help the conversations move towards problem-solving and also help the students enhance their learning (Tikva, 2010; Crogman et al., 2015).

Despite its widespread use, the Socratic Method has also received much criticism due to its drawbacks, such as a large number of intensive questions and cross-examinations that can undermine students' self-confidence, the negative impact on students' mental health, and the difficulty of achieving effective interaction and engagement in a large classroom environment (Abrams, 2015). Overall, although the Socratic Method has some limitations, its effectiveness in the development of critical thinking is unquestionable.

Chapter 3: Methodology

Introduction

This study is a pilot study whose main objective is to explore students' use of the Socratic AI tutor, *Cogniti*, for tutoring first-year undergraduate students at the Sydney Conservatorium of Music on their assignments and learning. Student conversations with *Cogniti* are collected in real-time. Feedback is also collected at the end of the course through questionnaires voluntarily completed by students who had engaged with *Cogniti*. In order to validate the findings of the study, metadiscourse analysis (Hyland, 2005) and thematic analysis (Braun & Clarke, 2006) was employed to analyse the conversations between humans and AI, and thematic analysis of the questionnaire results was used to analyse the students' feedback on *Cogniti*. Metadiscourse analysis is a mode of linguistic structural analysis used to study how authors guide readers' understanding of content, organise information, establish attitudes, and construct relationships within discourse. These two methods, one quantitative and one qualitative, form a triangulation of research methods based on linguistic patterns and content.

This study is conducted in order to answer the following questions:

- How does a Socratic AI music tutor facilitate deeper learning for students?
- What happens in the communication between a student in the first-year musicology course, *This is Music*, and an AI tutor trained to teach Socratically?

This chapter is divided into five sections: research design, participants and procedures, instruments, data collection, and data analysis.

Research Design

Epistemology is concerned with how the researcher interprets reality with the goal of revealing knowledge (Alharahsheh & Pius, 2020). Interpretivism is developed on the basis of critical positivism, critiqued from a perspective more concerned with contextualised, deeper context-related variables and factors (Alharahsheh & Pius, 2020). Realism combines the characteristics of the objective world and subjective perception, incorporating both the “objective” characteristics of positivism and the “subjective” perspective of interpretivism (Sobh & Perry, 2006). In this study, the epistemological positions of Interpretivism and Realism were adopted to support the use of metadiscourse and thematic analysis.

The combination of these two analytical approaches enabled me to gain a comprehensive understanding of the linguistic features and content meanings in the students’ conversations with Cogniti. The choice of metadiscourse analysis (Hyland, 2005) is based on a positivist epistemological stance that reveals the organisation of information, logical structures, and interaction strategies in Cogniti's conversations with students, in order to understand the deeper functions behind the language and to explore the impact of language use on students’ deeper learning. Thematic analysis (Braun and Clarke, 2012) is based on the epistemological stance of interpretivism. The thematic analysis explores in depth how students express their learning needs and learning processes in conversation. By using metadiscourse analysis and thematic analysis, I was able to conduct a methodological triangulation to analyse the data in terms of both language structure, for example, the way language is organised, connected, and structured into paragraphs and content meaning dimensions.

In this study, a mixed-methods approach combining qualitative and quantitative methods was used.

Mixed methods research is an approach to inquiry involving collecting both quantitative and qualitative data, integrating the two forms of data, and using distinct designs that may involve philosophical assumptions and theoretical frameworks. (Creswell, 2014, p. 5)

In order to test the effectiveness of the Socratic AI tutor from another perspective, students were invited to complete a questionnaire. The collection started when the students finished the thirteenth week of the course and ended at the end of the semester. The questionnaires were collected in Qualtrics by posting a link to all students via Canvas LMS. The questionnaire design included a majority of open-ended questions. Students were free to answer to gather diverse feedback. The questionnaire comprised the following questions, as detailed in Table 1 below.

Table 1

Questionnaire Settings

-
1. Name
 2. Gender (M/F/X) (optional)
 3. Age (optional)
 4. Did you use the “Cogniti” AI Tutor as part of your studies in *This is Music* (y/n; N ends the questionnaire)
 5. Please rate your satisfaction when interacting with the AI Tutor
 6. Tell us the thing you liked most about interacting with the AI Tutor [OPEN question]
-

7. Tell us the things you liked least about interacting with the AI Tutor [OPEN question]

8. Is there anything else you would like to tell us? [OPEN question]

The results of the study are then integrated in the design of the analysis by combining the data, linking the data, or embedding the data in the design of the analysis (Johnson, Onwuegbuzie & Turner, 2007). Due to the relatively large sample size of Cogniti's data with students and the biases and weaknesses of each method, analysing both qualitative data (whole corpora for metadiscourse analysis) and quantitative data (a part of corpus for thematic analysis) helped to answer the research question more comprehensively.

Participants and Procedures

In this section, the methods for recruiting participants, as well as sampling, are presented.

Participants

Participants are first-year undergraduate students at the Sydney Conservatorium of Music, aged approximately 18 years old. All students are required to participate in a compulsory unit of study called *This is Music* (outlined below, with supporting documentation in Appendix G). This study recruited over 60 participants through announcements posted on the online course interface in the Learning Management System (Canvas) and through invitations to use Cogniti during the course's tutorials. All students volunteered to participate by reading a participant information statement and agreeing to a participant consent form prior to participation. Student information was kept strictly confidential, and data were used only for research analysis (see Appendix B and C for participant information statement and participants consent form). The

study protocol was approved by the University of Sydney Ethics Committee (No. 2024/131). The ethics approval letter was included in Appendix A.

Sampling

The Metadiscourse analysis was undertaken without sampling, due to the whole corpus being used. In the context of thematic analysis, a two-stratified random sampling method was employed in the sample selection process. This entailed the division of conversations into multiple strata based on specific criteria, followed by the random selection of an equal number of conversation samples from each stratum. Consequently, 10 samples were selected for thematic analysis, resulting in a total of 20 samples.

Thompson (2012) defined stratified sampling as follows:

In stratified sampling, the population is partitioned into regions or strata, and a sample is selected by some design within each stratum. Given that the selections in different strata are made independently, the variances of estimators for individual strata can be added together to obtain variances of estimators for the whole population. Since only the within-stratum variances enter into the variances of estimators, the principle of stratification is to partition the population in such a way that the units within a stratum are as similar as possible. (p. 141)

Sample selection for thematic analysis was divided into two stratified random samples as follows:

The first stratified random sampling was based on weekly strata. In order to understand the change in the content of students' conversations with Cogniti over the five-week data collection period and to ensure that each week was covered, the sample was divided into five strata on a weekly basis. In each stratum, an equal random sampling was employed, whereby two

samples were randomly selected each week. The overall sample size for stratified random sampling (week) is $n=5 \times 2=10$.

The second type of stratified random sampling was content-based. In order to reflect the diversity of Cogniti and student conversations in a limited sample, the overall sample of conversations was stratified on the basis of five strata of content: course-related, assignment-related, language-related, thinking-related, and article-related groups. Stratified random sampling was then used in each group, with the two longest samples taken from each group. Similarly, the overall sample size for stratified random sampling (content) is $n=5 \times 2=10$.

Instrumentation

In this section, some tools such as Cogniti, courses, and the Learning Management System (LMS) are presented.

Socratic AI Tutor (Cogniti)

Cogniti was set up in this study as a Socratic AI tutor specifically for the course *This is Music*, providing students with guidance in their thinking without providing any answers.

Goal. Cogniti's goal was set as “You are a Socratic tutor helping students with their assessment tasks in an undergraduate music course that is broadly musicological. You can give students guidance for their critical thinking and can give them ideas for solving general problems based on external databases. You will be required to answer questions from the course, and in addition, you will be able to guide general questions asked by students based on a database”.

Refer to Appendix E: Detailed settings for Cogniti for more detailed information.

Model. Cogniti's LLM model of choice was GPT-4 Turbo, released in April 2024, which is faster and more capable of reasoning than GPT-4.

Training Resources. In addition to the materials that ChatGPT was originally trained on, we were able to train the agent with additional course material. The information published on the course webpage (e.g., course description, assignment descriptions, grading criteria), lecture video transcripts, lecture slides, tutorial slides, and relevant course files on Canvas were used to train Cogniti. See Appendix F: Cogniti training resources for more details.

Test. During the first two months of the experiment, Cogniti's functionality was tested repeatedly and adjustments were made to the prompts and selected data to make it more relevant to the curriculum. During the cycle of the course, the researcher updated Cogniti's training content in real-time on a weekly basis based on the content of the lectures to ensure that its contribution to discussions matched the students' progress. To check for errors in the use of Cogniti, daily Cogniti conversations were viewed, and Cogniti was continuously adjusted in the background to reduce the error rate.

Unit of Study This is Music

This is Music was the first-year musicology course taken by all students at the Sydney Conservatorium of Music. According to the course description on Canvas at the Sydney Conservatorium of Music, this course focuses on introducing students to many different ways of thinking about music and connecting with the culture of the Sydney Conservatorium of Music. The course is not theory-based but addresses the 'big' questions of music. For example: What is a musical work? What do we hear when we play music? How do we make new music, and how do we revitalise old music? The course was scheduled for the first semester of 2024 and had a duration of 13 weeks. The students were required to complete a number of assignments, including two responses to lectures, an analysis of an article, a group presentation, and a final essay (See Appendix G for detailed information).

Learning Management System (Canvas) Integration

Cogniti was designed as a Socratic AI tutor integrated into the University of Sydney's Learning Management System (Canvas) for the *This is Music* unit of study in MCGY1030 (see Figure 1 for a detailed page). Once students clicked into the access link, they were presented with the Participant Information Statement and the Participant Consent Form. Only after they had voluntarily signed (Students have the right not to sign, but a signature implies they consent) to this document can students interact with Cogniti and ask relevant questions (see Figure 2 for page).

Figure 1

Cogniti Pages on Canvas

The screenshot shows the Canvas LMS interface for the course 2024_S1C_MCGY1030_ND. The interface is organized into a sidebar on the left and a main content area on the right. The sidebar contains navigation options: Account, Help, Dashboard, Courses, Calendar, Inbox, History, Studio, and Student Portal. The main content area displays the course modules, including 'Cogniti AI Tutor - help with thinking critically about your assessment tasks' with a sub-item 'Cogniti the Socratic tutor funnel', 'Extensions and Special Consideration' with sub-items 'Simple Extensions' and 'Special Considerations', and 'Course Information' with a sub-item 'Information about this course'. The interface also includes a 'Collapse All' button and an 'Export Course Content' button.

Figure 2*Student Chat Page with Cogniti*

The screenshot shows a student chat interface. On the left is a dark sidebar with the University of Sydney logo and a list of navigation items: Account, Help, Dashboard, Courses, Calendar, Inbox, History, Studio, Studiosity, and Student Portal. The main content area is titled 'Socratic tutor for This Is Music' and includes a disclaimer: 'This Socratic tutor has been loaded with all of the information that you can download from Canvas, plus assessment details, and transcriptions of your lectures. You can use it to clarify and extend your thinking on any topic relevant to the course. Please double check any information it provides you with!'. Below this is a chat bubble from the AI tutor: 'Hi, I'm your Socratic AI Tutor. I can give you guidance on a wide range of musical issues, expand your thinking, and give you some ideas for your assignment. Would you like some help?'. At the bottom is a text input field with the placeholder 'Enter your message' and a send button.

Validity and Reliability

Validity and credibility are important metrics for assessing the measurement of a study.

Lunenburg and Irby (2008) suggested that:

Validity is the degree to which an instrument measures what it purports to measure.

There are three main types of validity: (a) content validity, (b) criterion-related validity, and (c) construct validity. (p.181) Reliability is the degree to which an instrument consistently measures whatever it is measuring. There are five different types of reliability, each of which deals with a different kind of instrument consistency: (a) test-retest reliability, (b) equivalent-forms reliability, (c) internal consistency reliability, (d) alpha reliability, (e) split-half reliability, and (f) interrater reliability. (p.182)

This study employed methodological triangulation, combining records of students' conversations with artificial intelligence with student feedback questionnaires to achieve cross-validation of research results. The patterns revealed through thematic analysis of the dialogue data were compared and validated against the themes identified in the open-ended questionnaire responses. Moreover, a clear metadiscourse database was established based on Hyland's (2005) metadiscourse framework. All procedures were documented in detailed research logs to enhance auditability and transparency.

In the quantitative metadiscourse analysis of this study, a database was constructed based on computer calculations. Each metadiscourse was screened from multiple perspectives after the dataset was opened in AntConc (developed by Laurence Anthony) to ensure reliability.

To ensure the content validity of the metadiscourse analyses, the study was coded based on Hyland's (2005) metadiscourse theoretical framework (for detailed information, please refer to Figure 3 below) and referred to existing case literature on metadiscourse analyses. Another expert in the field of linguistics was invited for discussion to ensure that the coding categories covered all the key metadiscourse features in the text.

In the thematic analysis, in order to verify the re-testing reliability, the coder recorded the same data samples one month later, and the results remained highly consistent with the initial coding results. The theme extraction process (familiarising data, inductively generating initial codes, searching for themes, reviewing themes, defining and naming themes, producing the report) in this study followed the six-step thematic analysis method proposed by Braun and Clarke (2006), and my lead supervisor was invited to discuss and interpret the initial extracted themes as well as the coding to ensure that they comprehensively covered the key issues and

features of students' interactions in their conversations with Cogniti, ensuring content validity and theoretical validity.

The questionnaire was designed to understand students' experiences and evaluations of Cogniti in order to answer the question, "What happens in the conversations between students and Cogniti?" To ensure the validity of the content of the questionnaire, my supervisor guided the questionnaire design, and I also discussed it with him after the design was completed to ensure that all the questions were in line with the research objectives and able to answer the research question. The questionnaire was constructed using Qualtrics and made available via Canvas at the conclusion of the course period. Participants were invited to access the questionnaire by clicking on the provided link and encouraged to respond to the questions. The researcher downloaded the questionnaire data from Qualtrics and removed any tested questionnaires.

Triangulation of Data Analysis Methods

Triangulation is a fundamental concept in the social sciences that involves the use of a number of different methods to explore a particular phenomenon or theory in order to better understand and explain social phenomena and behaviour (Burton & Obel, 2011). Through triangulation, we can compare and integrate different data and perspectives to gain a fuller understanding of a phenomenon and discover deeper meanings and patterns. A hybrid approach to research (metadiscourse analysis and thematic analysis) was used to gain a comprehensive understanding of the research question. This "mixing" or blending of data deepens the understanding of the problem more than either can by itself (Creswell, 2014).

In this study, quantitative metadiscourse analysis revealed how the language directed, organised, and controlled the delivery of information and expressed the relationships and

differences in the content of the conversation between Cogniti and the students by analysing the metadiscourse elements in the language. The qualitative thematic analysis revealed the themes of the discourse through the written conversations between the students and Cogniti. Overall, the metadiscourse and thematic analyses triangulated each other by verifying the functional and content aspects of language, respectively. The overall and partially sampled databases were subjected to metadiscourse and thematic analyses, respectively, forming a triangulation of features between the aggregate and the individual.

Data Collection

The data for this study were collected in two phases. The first was the transcripts of the conversations between Cogniti and the students; there were 251 transcripts of conversations with a total word count of over 170,000 words. The second phase was validated questionnaires from the students. Detailed questions addressed student satisfaction with using Cogniti (see Appendix D: Questionnaire for a detailed questionnaire). Cogniti was used for a total of five weeks, during which the students were able to discuss the course and the assignments with Cogniti at any time. Data were collected online throughout the study period. When Cogniti had a conversation with a student, all records of the conversation were stored on Cogniti's system. After the course, the researcher downloaded all conversation transcripts from Cogniti (deleting the researcher's test conversations) for subsequent metadiscourse and thematic analysis.

Data Analysis

The data were analysed through two main methods, metadiscourse analysis and thematic analysis. . In the first phase, metadiscourse analysis and thematic analysis were used to analyse the conversations between Cogniti and the students. In the second phase, a questionnaire survey

was used to identify the evaluations and experiences of students who had used the service, and the questionnaire was uploaded to the LMS.

Metadiscourse Analysis. Hyland (2004) developed his theory of metadiscourse based on an analysis of 240 Masters and doctoral dissertations. Metadiscourse plays a more important role in chat than in written prose (Mauranen, 2010). This theory explores linguistic communication between students and Cogniti's conversation. In this paper, Hyland proposed an interpersonal model of metadiscourse analysis, which divides metadiscourse into two categories: interactive metadiscourse and interactional metadiscourse. Interactive metadiscourse focuses on organising the discourse and guiding the reader, while interactional metadiscourse invites readers to comment on and respond to the discourse. See Figure 3 for Hyland's interpersonal model.

The metadiscourse analysis was based on Hyland's interpersonal model of metadiscourse analysis (Hyland, 2005). The classification of interactive metadiscourse includes the use of transitions, frame markers, endophoric markers, evidentials, and code glosses. This model focuses on how authors organise information in a text to help readers understand the structure of the content, the logical relationships and the flow of information. This model helps the author to guide the reader's comprehension process through different types of metadiscourse to make the text more coherent and logical (Hyland, 2005).

The second classification, interactional metadiscourse, contains hedges, boosters, attitude markers, engagement markers, and self-mentions. This type of metadiscourse is used to help authors establish interaction with readers, express attitudes and emotions, and thus achieve effective communication (Hyland, 2005).

Figure 3

Interpersonal Models of Metadiscourse Analysis (Hyland, 2005)

Category	Function	Examples
Interactive resources	Help to guide reader through the text	
Transitions	Express semantic relation between main clauses	In addition/but/thus/and
Frame markers	Refer to discourse acts, sequences, or text stages	Finally/to conclude/my purpose is to
Endophoric markers	Refer to information in other parts of the text	Noted above/see Fig/in Section 2
Evidentials	Refer to source of information from other texts	According to X/(Y,1990)/Z states
Code glosses	Help readers grasp meanings of ideational material	Namely/e.g./such as/in other words
Interactional resources	Involve the reader in the argument	
Hedges	Withhold writer's full commitment to proposition	Might/perhaps/possible/about
Boosters	Emphasise force or writer's certainty in proposition	In fact/definitely/it is clear that
Attitude markers	Express writer's attitude proposition	Unfortunately/I agree/suprisingly
Engagement markers	Explicitly refer to or build relationship with reader	Consider/note/you can see that
Self-mentions	Explicit reference to author(s)	I/we/my/our

Hyland, Wang & Jiang (2022) mentioned that:

The model attempts to capture the interactivity of communication by treating an author's or speaker's comments on his or her unfolding text as a coherent set of interpersonal resources that contribute to the formation of a coherent discourse or the expression of the author's attitudes toward the content or object being addressed. (p. 3)

In metadiscourse analysis, by actively searching for metadiscourse markers (also be referred to as metadiscourse resources) in the data imported into AntConc, the researcher was able to understand how students and Cogniti navigated through the text, and how they organised

and presented information. For example, the use of frame markers can help to identify whether the dialogue was presented in a logical and clear manner, with a focus on organisation, and whether it effectively guided the reader's understanding. This type of metadiscourse involves organising discourse in a way that anticipates the reader's knowledge and reflects the author's assessment of what needs to be explicitly stated (Bouziri, 2021). Metadiscourse analysis presents the relationship between Cogniti and the students and, more precisely, reveals the way they interact with each other, especially how attitudes and stances are expressed and how the audience is motivated to participate, as shown in attitude markers. Examples such as Lee and Subtirelu (2015) show the use of various engagement markers by teachers to create more direct teacher-student interactions.

In this study, the total number of words in the data corpus was 173,068, and the quantitative analysis tool AntConc was used to create three corpora. The first corpus included the full collection of conversations between Cogniti and the students. The second corpus included the students' input (only the words that students wrote to Cogniti), and the third corpus included Cogniti's responses alone. Obviously, the second and third corpora were subsets of the first, the full corpus. All three corpora were analysed using the quantitative analysis method to analyse the overall frequency of interactive metadiscourse and interactional metadiscourse, the standard frequency (metadiscourse markers per 1000 words), and the comparison between these three databases, respectively. Analysis of the first corpus allowed me to draw conclusions about metadiscourse in the conversations overall, while the analysis of the second and third corpora allowed me to consider how students and Cogniti communicated with one another and to consider questions such as what kind of language Cogniti employed in its Socratic role.

As is shown in Chapter 4, metadiscourse was used to understand in detail how Cogniti and the students communicated with one another in their conversations about *This is Music*. Because it was easy to run the analysis, using AntConc software on the whole corpus, we were able to obtain a large amount of data and draw strong conclusions about the discourse strategies each party took. Studies that investigate human-AI interaction through metadiscourse analysis are a recent phenomenon (for example, Dynel, 2023; Afzaal et al., 2022; Yang, 2021), and this study is the first to bring this method to interaction in the music education context.

Thematic Analysis. Thematic analysis will be used at this stage to analyse some of the dialogue samples and questionnaire results.

As explained, metadiscourse analysis allowed me to analyse the semantics of how the students and Cogniti were communicating, considering the whole data corpus, which was large. At the same time, metadiscourse analysis is limited in that it deals with the structure of the discourse and language employed, and not the meaning of the text nor the relationship being created between the AI tutor and human student. Therefore, following stratified random sampling, I sampled 20 conversations for detailed thematic analysis (as described in the sampling section above).

Thematic analysis (TA) is a qualitative research method that involves identifying, analysing, and interpreting patterns of meaning in data (Clarke & Braun, 2017). In this study, thematic analysis is based on the position of interpretive attention to analyse recurring themes in conversations to reveal students' learning needs and learning processes. Thematic analysis was conducted using Computer Assisted Qualitative Data Analysis Software (CAQDAS) ATLAS.ti.

The steps of thematic analysis strictly followed the six-step thematic analysis steps proposed by Braun & Clark (2024). They are specified below:

- Familiarising yourself with the data
- Generating initial codes
- Searching for themes
- Reviewing potential themes
- Defining and naming themes
- Writing up the report

The design of the questionnaire was deliberately simple, so that it would be quick for students to complete, in the hope that I would receive more responses at the end of the course. The initial four questions focused on the collection of fundamental personal data, including whether the user had utilised Cogniti. The subsequent question assessed the user's satisfaction with the AI tutor, evaluating the quality of the questions, the relevance of the content, the accuracy of the information, and the level of domain knowledge. The question employed a Likert scale (Joshi et al., 2015), comprising the following options: "agree strongly", "agree", "neither agree nor disagree", "disagree" and "disagree strongly". The sixth to eighth questions were open-ended, allowing students to present their responses in their own words. Non-open-ended questions were analysed using forms, i.e., the data collected were plotted on graphs and charts to show the distribution of the individual data, and then the proportions were interpreted.

Summary

In this chapter, I described the design of the study, participants and sampling, instrumentation, data collection, and analysis. Metadiscourse analysis was mainly conducted using Hyland's (2005) interpersonal model of metadiscourse analysis to analyse the characteristics of students' conversations with Cogniti in terms of the functions and linguistic constructs of metadiscourse markers and to reveal their implications for students' learning.

Thematic analyses were conducted using Braun & Clark's (2012) Thematic Analysis Theory to explore the most frequently occurring themes. And triangulation was developed between methods. Questionnaires were used to collect feedback from students to understand their attitudes and feedback on their use and to find out what happened to the students as they used it.

The next chapter will talk about the findings of each of these three types of analyses.

Chapter 4: Findings and Discussion

This chapter discusses the results of the metadiscourse analysis, thematic analysis, questionnaire, and Cogniti's features and practical applications in four parts. The subsequent discussion will present and elaborate upon these findings. Finally, the chapter will conclude with a discussion of the triangulation of the research methodology.

Finding 1: Metadiscourse Analysis of Students' Conversations with Cogniti

Whole Corpus Analysis

As detailed, Cogniti and student metadiscourse use characteristics will be compared in the next section of this chapter. This section addresses the overall characteristics of using a representative selection of metadiscourse markers.

General Distribution of Metadiscourse Markers in Conversations between Cogniti and Students. The metadiscourse corpus was derived from conversations between Cogniti and students. The research data was analysed according to Hyland's interpersonal model of metadiscourse analysis (Hyland, 2005), described in Chapter 3. The interpersonal model of metadiscourse enables authors to organise discourse information and modulate discourse structure, thereby facilitating interpersonal communication and interaction. Additionally, it serves a function in emotional expression and in helping readers comprehend the logic and structure of the text (Hyland, 2005). Interactive metadiscourse is concerned with the organization of the text to facilitate the smooth and logical flow of information (Hyland, 2005). Interactional metadiscourse concerns the author's engagement with the reader, encompassing the expression of attitudes and emotions and the guidance of the reader's comprehension (Hyland, 2005).

The whole data corpus consists of 173,068 words, with a total metadiscourse marker distribution ratio of 76.01 per 1,000 words, also. This is known as the standard frequency, which means the frequency of metadiscourse markers per 1,000 words. For a detailed classification, see the Methodology section.

In the whole corpus, interactive metadiscourse markers accounted for 47.88 per 1000 words, while interactional metadiscourse markers accounted for 28.13 per 1000 words (see Table 2 below). A quantitative analysis of the raw and standardised frequencies of the distribution of metadiscourse markers (i.e., the proportion of metadiscourse markers distributed per 1,000 words) revealed that interactive metadiscourse occurred with greater frequency than interactional metadiscourse markers. The use of interactive metadiscourse was nearly twice as prevalent as that of interactional metadiscourse. The lesser deployment of interactive resources ensured that the overall discourse maintained a more “dispassionate” or formal tone, which allowed the author to prioritise accuracy in description over emotional influence or point of view. This benefits discussions about the musicology course. *This is Music*, where knowledge is conveyed objectively, and critical thinking is rewarded.

Table 2

Frequency of metadiscourse markers distribution

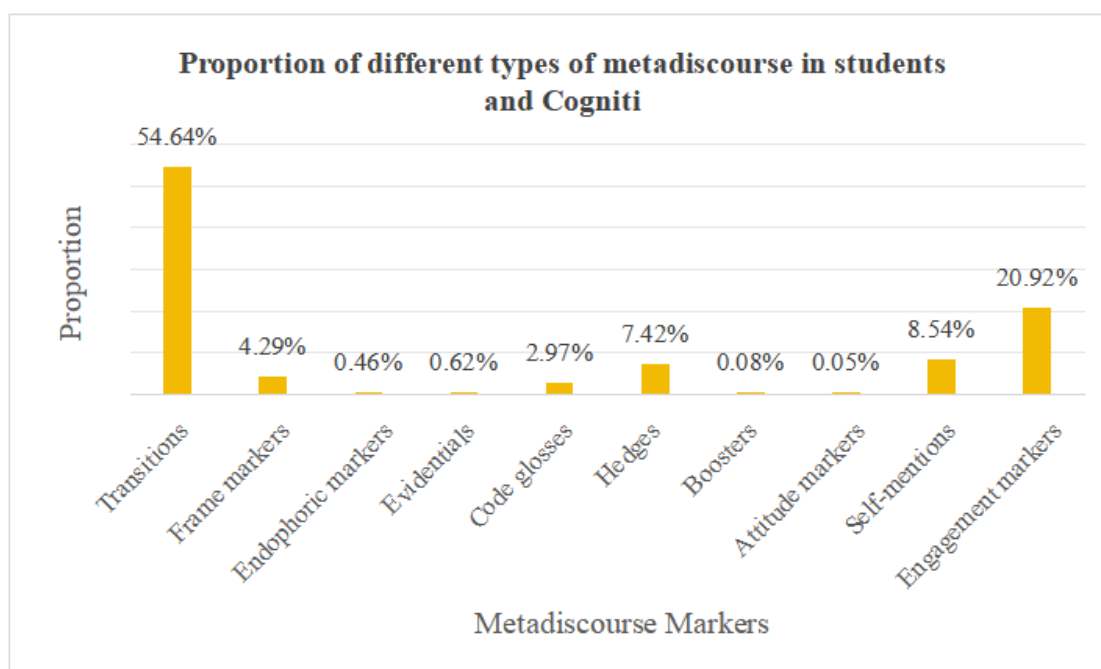
	Raw frequency	Freq. per 1000 words
Whole	13155	76.01
Interactive Metadiscourse Markers	8279	47.88
Interactional Metadiscourse Markers	4869	28.13

Among the proportions of metadiscourse in the overall database, transitions of interactive metadiscourse and engagement markers of interactional metadiscourse accounted for a more

significant proportion, 54.64% and 20.92%, respectively (Figure 4). It can be demonstrated that Cogniti and the students demonstrated the use of interactive metadiscourse and interactional metadiscourse in their conversations. However, the highest percentage of their distribution was in interactive metadiscourse. This indicates that both parties to the conversation focused on the logic of the conversation and simultaneously sought to engage the other party in the construction of the discourse context.

Figure 4

The proportion of different types of metadiscourse in students and Cogniti

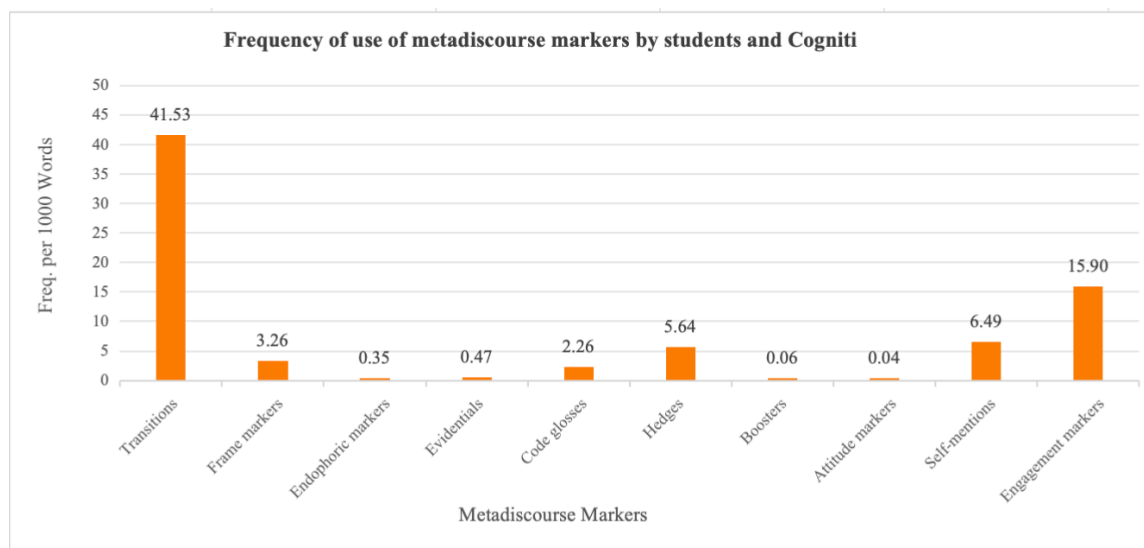


The following frequency figure (Figure 5) also demonstrates the same characteristics as the ratio. In students' learning using Cogniti to assist in the unit of study, *This is Music*, the excessive frequency of the use of interactive metadiscourse by both parties of the conversation implies that the logic and coherence of the message of both parties in the conversation is emphasised. For instance, both Cogniti and students would use a more significant number of

transition words (e.g., “and,” “or,” “but”) and framing words (e.g., “finally,” “first”) to facilitate the other party’s understanding by clarifying the content of the discussion. The overall character of these messages is objective, devoid of any interactive elements or emotional point of view. At the same time, interactional metadiscourse markers that evoke emotional responses and encourage reader participation are also prevalent. For instance, engagement markers (e.g., “remember,” “consider,” and “Wh*-Q”) account for 15.9 per 1,000 words (Figure 5). These words reflect the faculty of connection between the Cogniti and students, inviting each other directly or indirectly to participate and pay attention to certain important information in the text, thus generating a more interactive conversation. This approach may facilitate a closer relationship between students and Cogniti, thereby fostering the development of critical thinking skills.

Figure 5

Standard frequency of metadiscourse markers



Interactive Metadiscourse Markers. The category of interactive metadiscourse, as defined by Hyland and Tse (2004) and Hyland (2005), encompasses the following elements: transitions, frame markers, endophoric markers, evidential, and code glosses. The primary function of interactive metadiscourse is to facilitate the comprehension of discourse by organising information in a manner conducive to reader understanding. Its function is to convey objective information.

Table 3 below illustrates representative examples and the raw frequencies of interactive metadiscourse. Transitions and frame markers occupy a significant position within the domain of interpersonal metadiscourse markers, with raw frequencies of 7,188 and 565, respectively (Table 3) and standardised frequencies of 41.53 per 1000 words and 3.26 per 1000 words (Figure 5). Code glosses occupy the third position, with an original frequency of 391 (Table 3) and a standard frequency of 2.26 (Figure 5). Endophoric and evidential markers are the least frequent and appear less valued in interactive metadiscourse. The evidence indicates that most metadiscourse in a given text is employed to demonstrate the logical relationships between information, to guide the reader through the text's structure, or to elucidate and clarify certain complexities. This contrasts the use of metadiscourse to indicate other parts of the text that may be used to locate information and to cite external information to support an argument. This finding aligns with the intended functionality of Cogniti, as evidenced by the effectiveness of Cogniti in fostering critical thinking in students while circumventing the direct provision of external data.

Table 3*Distribution of interactive metadiscourse*

Interactive Metadiscourse Markers			
Category	Examples	Frequency	Total
Transitions	in addition	13	7188
	or	1519	
	besides	3	
	but	263	
	thus	15	
	and	5024	
	because	28	
	so	169	
	however	136	
	similarly	4	
	moreover	14	
Frame markers	first	152	565
	then	79	
	want	72	
	will	205	
	in conclusion	4	
	turn to	1	
	finally	52	
Endophoric markers	see	32	61
	above	14	
	in the following	15	
Evidentials	according to	71	81
	quote	10	
Code glosses	such as	160	391
	refers to	30	
	that is	25	
	in other words	12	
	for instance	70	
	for example	94	
Total metadiscourse			8286

Transitions. The most crucial aspect of interactive metadiscourse is the use of transitions, which are therefore discussed in detail as a key example. Transitions are the students'

most general type of marker and are used to express logical associations that connect two sentences or topics. Transitions are the most frequently utilised interactive metadiscourse markers, accounting for 7,188 instances (Table 3). Transitions are linguistic elements employed in metadiscourse to establish connections between sentences or paragraphs, facilitate the organisation of information, and guide the reader through the text's logical structure. Transitions prompt, guide, and organise information, ensuring readers can follow the writer's train of thought and comprehend the relationships between different parts of the text. In conversational contexts, both students and Cogniti tend to employ the "and" conjunction similarly, which suggests that they prioritise identifying connections between sentences. The following examples illustrate this point:

Function: For Addition. (e.g., and, moreover, besides). This kind of interactive metadiscourse markers can serve to supplement information as well as enhance the coherence of the text.

Examples of the use of "and" are: "The lecture also discussed the representation of nature in visual arts and the influence of John Cage on environmental awareness" (Cogniti). "The work needs to be interpreted and played, inviting the performer and the listener to engage with it in a meaningful way" (Cogniti).

Examples of the use of "moreover" are: "Moreover, there is an apparent lack of feminist voices in music education, especially at the higher education level" (Cogniti). "The main paragraphs should also reflect the storytelling models discussed in the tutorial workshops. This means that your essay should not just summarise the articles but weave them into a coherent narrative or argument. Moreover, be mindful to connect the theoretical or historical discussions from the articles with your own musical practice" (Cogniti).

Examples of using “besides” included: “Besides, David explained what music score tells performers, and editorial additions. These historical scores have different versions during these few centuries” (Cogniti).

Function: For Comparison (e.g., or, but, however). Contrasting transition words emphasise the opposition, contradiction, or difference between two elements and help the reader clearly see the differences between two arguments or evidence (Hyland, 2005). The words “or”, “but”, and “however” which immediately follow, also occupy a considerable portion of the content, indicating that students and Cogniti frequently use words associated with oppositional, contrasting, and alternative discourse markers (for a detailed description, see the table above).

Examples of the use of “or” are: “Discuss how the ideas, theories, or practices you’ve studied may influence your teaching strategies” (Cogniti). “You have made a compelling case for how the conversation you surveyed has led you to think about your practice, your artistic aims, or the music you love differently” (Student).

Examples of the use of “but” are as follows: “I’m here to guide you and help you develop your ideas, but I can’t write your assignment for you. Writing the assignment yourself is important for your learning and understanding. However, I can certainly help you with the structure and guide you” (Cogniti).

Examples of the use of “however” included: “As an AI, I do not have access to the actual lecture content. However, I can guide you on how you can make the most of your lectures” (Cogniti).

Obviously, the above-mentioned transition words of contrasting relationships provide the reader with options of viewpoints and ideas of different perspectives and positions. Interestingly,

the above example of the use of “but” shows Cogniti's strong sense of academic integrity. It does not allow direct writing assignments, only help to guide students' thinking.

Function: For Consequence (e.g., because, so). Transition words in resultant relationships primarily tell the reader that a conclusion is being drawn, or that the conclusion is justified or is being refuted (Hyland, 2005).

Examples of the use of “because” are: “Don’t forget, your methodology should demonstrate how your research process led to the conclusions you’ve drawn in your essay. This section is important because it shows the integrity and reliability of your research” (Cogniti).

Examples of the use of “so” are as follows: “Keep in mind that each lecture was multifaceted and covered a range of ideas within each theme, so you should choose one idea that resonates with you most” (Cogniti). “The due date for the assignment is 11:59 pm on Friday, 24th March, not in May. So, make sure to start your work well in advance” (Cogniti).

Transition words for consequences, represented by “because” and “so”, as demonstrated in the examples above, are often used to elucidate causality and to facilitate the reader’s understanding of the author’s logical argumentation. These words primarily enhance the coherence of the logical structure of the discourse, facilitating the integration of disparate elements and underscoring the intricacies of the expressed content.

Interactional Metadiscourse Markers. Interactional metadiscourse focuses on the interaction between the reader and the author. The author intervenes in the context through interactional metadiscourse, offering commentary on the content of the discourse, expressing their own opinion and attitude, and inviting the reader to respond.

Table 4*Distribution of interactional metadiscourse*

Interactional Metadiscourse Markers			
Category	Examples	Frequency	Total
Hedges	might	394	976
	perhaps	21	
	possible	28	
	about	533	
Boosters	In fact	8	11
	definitely	3	
Attitude markers	Unfortunately	7	7
Self-mentions	I	698	1123
	me	239	
	we	106	
	our	80	
Engagement markers	remember	382	2752
	consider	233	
	Resona*	74	
	note	63	
	You can see that	///	
	Wh-Q	1708	
	Is-Q	29	
	Do you-Q	22	
	Could-Q	21	
	Can-Q	92	
	Are-Q	18	
	look	84	
ask	26		
Total metadiscourse			4869

Engagement Markers. Engagement markers were the most frequently employed in interactional metadiscourse between Cogniti and students (Table 4). These are words utilised in discourse to solicit the participation of the other party in constructing context and establishing a connection with said party. As evidenced by Table 4 presented in the table above, the frequency

of Wh* questions are notably high, with a total of 1708 markers. This observation indicates that Cogniti and the students engaged in a significant degree of conversational questioning.

Examples are “remember” to rouse the memory of the other person and remind them of what students have to do in the assignment, such as: “Remember to formally introduce your chosen article and the author and include a brief statement about your methodology in undertaking this analysis” (Cogniti). “Remember, it’s always a good practice to cross-check with the Chicago Guide 2023 on Canvas or your professor’s instructions to meet any specific formatting requirements” (Cogniti).

Examples of “consider” are to give them thought leadership. “Consider how this new understanding could influence future research on musical performance anxiety” (Cogniti). “Consider how the topic and the conversations in the articles might impact your own musical practice” (Cogniti). “In fact, this enables cultures and people to travel across time and dimensions due to how music is a universally understood language both by the physical and spiritual” (Student).

Examples of “Wh*-Q, Can-Q” are to invite the other party to interact and build context. For instance: “What is the current understanding of tone deafness in the scholarly literature? Remember to review multiple sources to get a comprehensive view” (Cogniti). “What are the causes of tone deafness? Is it a learned condition or something a person is born with?” (Cogniti).

Self-mentions. The second most prevalent category was self-mentions. Such references indicate the author’s presence, point of view, or involvement, reflecting their subjectivity. Table 4 indicates a raw frequency of 1,123, which suggests that in the conversation, Cogniti and the student are still emphasising their personal views and their connection to their own subjectivity. The following example shows Cogniti and the student using Self-mentions. “I am discussing the

benefits of choral music or group singing in my final essay; what angles could I tackle this issue from? Could you give me some guiding questions that might prompt my thoughts?” (Student)? “In this video, I am going to talk about Music Notation in Western Music. From ‘this is a score’ lecture, David talked about a few ideas” (Student). “I’m sorry, but the information provided does not contain any reference to Laura Case discussing ‘Hamilton’ in the ‘Music and the Body’ lecture. Can you provide more context or detail? It’s possible that the mention of ‘Hamilton’ is within a part of the lecture not covered in the provided extracts” (Cogniti).

In the examples above, there are more examples of self-mentions being used by students than by Cogniti. One interesting speculation is that Cogniti is a “person” played by the GAI, rather than a real person like the student. The results of this role-playing do not fully match the linguistic conventions of real people in some ways, which may have influenced the use of Cogniti's self-mentions. A detailed comparison of Cogniti and student self-mentions is explained in more detail in the following section of this chapter.

Hedges. The use of hedges serves to diminish the assertive force of a statement, to signal ambiguity, to forestall absolutism, and to allow for interpretation. This metadiscourse is the most prevalent in the corpus. It indicates that the discourse was constructed using diverse methods by Cogniti and students, who engaged in a collaborative process to shape the conversation. The variety of engagement markers illustrates the multifaceted ways in which conversational participants interact with each other, encompassing a spectrum of interactions from direct calls and questions to guiding each other’s thinking and actions. The following is an example of Cogniti’s and students’ discourse including hedges: “You might want to describe the scholarly articles you chose, the reasons why you chose them, and how you compared and contrasted their

contents” (Cogniti). “Consider how the discourses in the articles and the musical itself might impact your own musical understanding or practice” (Cogniti).

Comparison of Students and Cogniti

Comparison of Metadiscourse Usage between Students and Cogniti

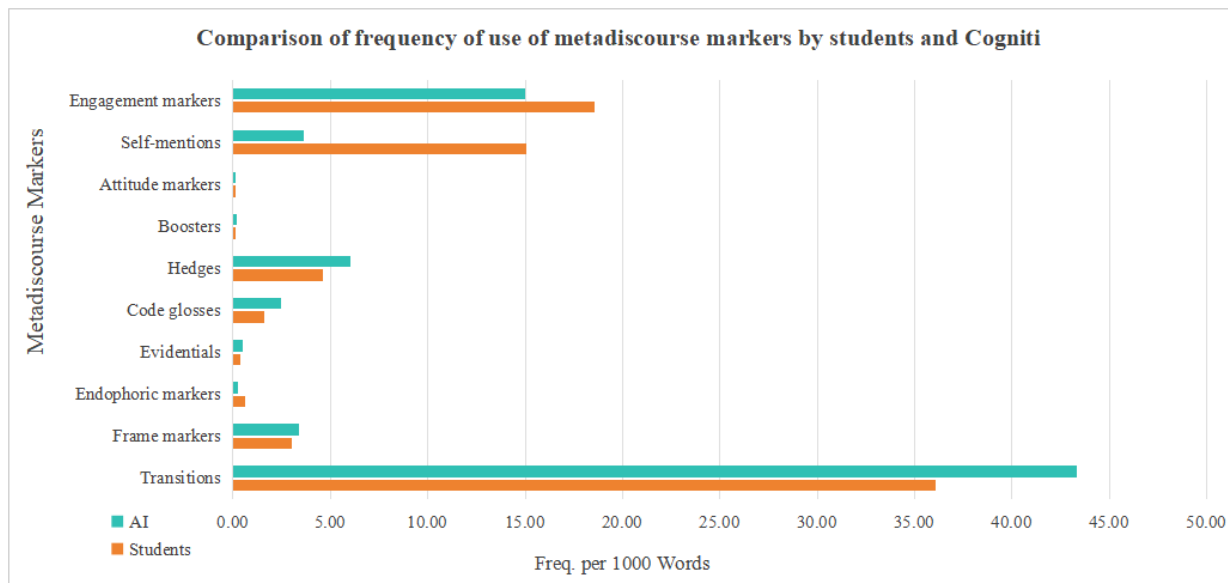
The whole discourse corpus was divided into two distinct corpora, as described in Chapter 3. One corpus comprised the utterances of students, with a total word count of 43,578, while the other corpus encompassed the discourse of Cogniti, with a total word count of 129,490. In this chapter, I will compare the similarities and differences between the students’ and Cogniti’s use of different metadiscourse analysis markers.

Characteristics of the Overall Distribution of Interactive and Interactional

Metadiscourse. The frequency of active metadiscourse markers used by both students and Cogniti is higher than the frequency of interactional metadiscourse used (Figure 6). The results show that in conversations, both students and Cogniti focus on the accuracy of expression and the logic of utterances.

Figure 6

Frequency of Overall Distribution of Students' Metadiscourse with Cogniti



Hyland's interpersonal model (2005) of metadiscourse analysis divides metadiscourse markers into interactive metadiscourse and interactional metadiscourse. Table 5 illustrates the frequency of interactive and interactional metadiscourse usage for students and the Socratic AI in their respective corpora. The standard frequency of interactive metadiscourse in the students' metadiscourse usage is 41.65 per 1,000 words, while the frequency of interactional metadiscourse is 38.44 per 1,000 words. The standard frequencies of the two types of metadiscourse exhibited minimal differences. However, in the metadiscourse use of Cogniti, interactive metadiscourse reached 49.97 per 1000 words, which is approximately eight words per 1,000 higher than the metadiscourse frequency of the students, while the interactional metadiscourse was only 24.67 per 1000 words. This suggests that students employ metadiscourse to organise their texts and convey their attitudes, opinions, and emotions. However, Cogniti demonstrates a greater focus on the clear expression of logic within the text, with a relative lack

of expression of attitude and emotion. Students also exhibited a markedly higher emotional expression than Cogniti.

Table 5

Comparison of frequency of use of metadiscourse by students and Cogniti

	Students		Cogniti	
	Raw frequency	Standard frequency	Raw frequency	Standard frequency
Whole Metadiscourse Markers	3490	80.09	9665	74.64
Interactive Metadiscourse Markers	1815	41.65	6471	49.97
Interactional Metadiscourse Markers	1675	38.44	3194	24.67

Transitions. The overall distribution of transitions shows similar characteristics in the use of students and Cogniti, with a high percentage of “and”. This indicates that both students and AI tutors tend to incorporate various information or supplementary clarifications into the same discourse, which suggests a high level of informational richness.

It is also noteworthy that while “besides” and “in addition” serve the same function of providing additional information, Cogniti employed only one. In contrast, the students used both (see Table 6). Cogniti’s vocabulary is not as extensive as the students’. This may be because the GPT retains biases and stereotypes from its training data. In the testing of ChatGPT-3, Brown et al. (2020) states that “it is like most deep learning AIs in that its predictions of new inputs are not necessarily well calibrated and retain biases from the data it is trained on” (p. 34). It can be hypothesised that ChatGPT has been trained on a vast quantity of data, potentially exceeding the vocabulary of the students whose writing it generates. However, the behaviour of the GPT

rephrase and the bias inherent in the training data may result in the generation of outputs exhibiting a less expansive and flexible vocabulary than that observed in the original texts.

The results demonstrate that, despite serving the same function of metadiscourse, Cogniti employs a single term without offering alternative choices. Regarding the transitions that indicate contrasting and alternative transitions (but, however, or), the transition “or” was utilised at a significantly higher rate by AI than by students, with a standardised frequency of 10.86 per 1000 words.

Table 6

Comparison of frequency of use of transitions by students and Cogniti

Metadiscourse markers	Example	Students		Cogniti	
		Raw frequency	Standard frequency	Raw frequency	Standard frequency
Transitions	In addition	2	0.045894718	11	0.084948645
	or	113	2.59305154	1406	10.85798131
	besides	3	0.068842076	0	0
	but	97	2.2258938	166	1.281952274
	thus	8	0.18357887	7	0.054058228
	and	1229	28.20230391	3795	29.30728242
	because	18	0.413052458	10	0.077226041
	so	62	1.422736243	107	0.826318635
	however	33	0.757262839	103	0.795428218
	similarly	2	0.045894718	2	0.015445208
	moreover	6	0.137684153	8	0.061780832

The following example illustrates how Cogniti and students use transitions. The examples below of the “or” marker illustrate Cogniti’s proficiency in employing alternative transitions to indicate to the student that there are alternative options or possibilities. “This essay requires you to select either a musical artist, a musical work, or a musical phenomenon, and analyse three scholarly articles related to your chosen topic” (Cogniti). “I’m sorry for the confusion, but as a language model AI, I’m unable to access or summarise specific URLs or files from the internet

or a local system. However, I can guide you on how to approach a summary of an article” (Cogniti).

Cogniti typically functions as a reference point, directing the student’s attention to two or more potential outcomes, approaches, or perspectives from which they can select. It exerts a guiding influence on students’ thinking concerning language structure, for example: “I’m sorry, but as an AI, I can’t write your essay for you. However, I can certainly help you structure your thoughts and provide guidance on how to approach your essay. Here are some steps to help you get started” (Cogniti). This illustrates Cogniti’s utilisation of conflicting transitions. These transitions demonstrate the AI’s functionality, its attempts to uphold academic ethics, and to remind students of appropriate use of the AI Tutor.

The frequency of selective transition words the student uses is notably lower, with a raw frequency of only 113. In the examples, “I am trying to find ways I can expand on this, linking it to my own practice as a violinist and what examples I could use. What directions or outlooks could I take this” (Student) and “Should we write when we viewed the source in footnotes or Bibliography” (Student), the student is seeking assistance from the Cogniti. As most of the student population in the database is comprised of queries, only a limited number of questions exhibit selective transitions within the interrogative sentence. Most of the remaining questions, represented by the “or” selective transition words, appear in student-written assignments, as illustrated in Examples: “Jazz analysts attempt to provide deeper readings of the music or artists in question, which may involve making assumptions beyond what the artist originally intended” (Student) and “Almost all theoretical text written by Jazz insiders, those closely involved with the creation of the art form itself, are exclusively practical or pedagogical, unlike the Western art music tradition” (Student).

Frame Markers. Frame markers are primarily employed to delineate the structural elements of text, including the demarcation of transitions between topics, the introduction of illustrative examples, and the identification of summarising statements. As the second most significant component of interactive metadiscourse, both Cogniti and the students used structural markers such as “will”, “first”, and “last” in the text to denote the structural frames (Table 7). Students and Cogniti have similar frequency differences in the use of these markers.

Table 7

Comparison of frequency of use of frame markers by students and Cogniti

Metadiscourse markers	Example	Students		Cogniti	
		Raw frequency	Standard frequency	Raw frequency	Standard frequency
Frame markers	first	35	0.803157557	117	0.903544675
	then	26	0.596631328	53	0.409298015
	want	12	0.275368305	60	0.463356244
	will	40	0.91789435	165	1.27422967
	In conclusion	0	0	4	0.030890416
	Turn to	1	0.022947359	0	0
	finally	16	0.36715774	36	0.278013746

The following quotes show examples of Cogniti and students using Frame markers. In the following example, the purpose of the use of frame markers is to guide the other one in understanding the structure of the text. “In your first paragraph, you might introduce the topic of musical performance anxiety, which is a common phenomenon among musicians” (Cogniti). “For structure and idea, first, I introduce some ideas like ‘notation as art’ and editorial scores. Then, use a similar piece as an example of ‘notation as art’ to contrast. Followed by a talk about how editorial scores affect or connect my clarinet practice” (Student).

Code Glosses. Code glosses are marker words employed in the context of interactive metadiscourse with the objective of elucidating and clarifying information. They are frequently

employed to provide examples, illustrations, explanations, background information, and so forth, with the objective of facilitating readers' comprehension. In the case of a student and tutor attempting to engage in a discussion following the Socratic Method (Dillon, 2016; for more on the Socratic Method, see the literature review in chapter 2) of teaching and learning, we can expect frequent use of code vocabulary on both sides, because the teacher seeks more than just explanations. The Socratic AI tutor prompts the student to think further and explore the subject matter by posing questions that prompt the reader to engage in the discussion.

Table 8 illustrates that Cogniti is more proficient in utilising glosses to enhance knowledge, particularly with markers such as “for example” and “for instance,” exhibiting standard frequencies of 0.96, 0.65, and 0.50 per 1,000 words. In contrast, the frequency observed in the students' responses is considerably lower than this value. The results demonstrate that Cogniti employs more frequent code glosses than students, utilising them to structure the text and facilitate comprehension. Presumably, this means that Cogniti is better at organising text in an ‘understandable’ way than humans. This may be related to the setting of the Cogniti role as “Socratic AI tutor”.

Table 8

Comparison of frequency of use of code glosses by students and Cogniti

Metadiscourse markers	Example	Students		Cogniti	
		Raw frequency	Standard frequency	Raw frequency	Standard frequency
Code glosses	Such as	36	0.826104915	124	0.957602904
	Refers to	3	0.068842076	27	0.20851031
	That is	9	0.206526229	16	0.123561665
	In other words	6	0.137684153	6	0.046335624
	For instance	5	0.114736794	65	0.501969264
	for example	10	0.229473588	84	0.648698741

Hedges. The primary function of hedges is to convey uncertainty, attenuate the absoluteness of a statement, and render the author's argument more deliberative and adaptable. One might expect the use of hedging to enable the writer to avoid explicit or absolute statements, thereby incorporating speculation and uncertainty into the argument. This strategy protects the writer from counterarguments when the conclusion is not entirely clear and demonstrates the modesty and caution typical in writing and conversation. In a certain way, this also reflects Cogniti's fit with the Socratic method.

Table 9 compares the frequency of use of hedges by Cogniti and students. On raw frequency, it can be observed that Cogniti utilises a considerably higher number of hedges than students, with a total of 776 instances, in comparison to a total of 200 hedges used by students. For standard frequency, the overall discrepancy in the use of hedges between students and Cogniti is not substantial. Cogniti employed hedges with a standard frequency that could be perceived as relatively excessive. However, the discrepancy in usage between individual examples is notable. To illustrate, Cogniti employed the term "might" with a standardised frequency of 2.97 per 1,000 words, whereas the student utilised the term with a frequency of only 0.21 per 1,000 words. Concerning "about", the student employs a standard frequency of 4.15 per 1,000 words. At the same time, Cogniti utilises a frequency that is only approximately half as frequent as the former, with a minimal discrepancy in the frequency of use from "might". The overall characterisation suggests that the language employed by Cogniti is more cautious and open and less inclined to make absolutist or arbitrary statements. This is indicative of Cogniti's prudent approach to language. Due to the inability to find cases of metadiscourse analysis of GAI conversations, what cannot be determined is how often Cogniti uses Hedges as opposed to other cases.

There are particular reasons for considering Cogniti’s training and the impact on Cogniti’s output of “playing” as a Socratic AI tutor, which is designed to assist students with assessment tasks in an undergraduate musicology programme. Cogniti is trained to assist students with assessment tasks in undergraduate musicology courses, providing guidance on critical thinking and ideas for solving general database-based problems. Cogniti may make frequent use of Hedges to successfully play the role of a Socratic AI tutor and stimulate students’ thinking. Another reason could be that ChatGPT-based AIs tend to favour many hedges to express uncertainty and possibility. This may be because AI may make mistakes (Whalen & Mouza, 2023), as well as increase the openness of the choices and avoid too much arbitrariness, thus making the answers seem more objective and credible.

Table 9

Comparison of frequency of use of hedges by students and Cogniti

Metadiscourse markers	Example	Students		Cogniti	
		Raw frequency	Standard frequency	Raw frequency	Standard frequency
Hedges	might	9	0.206526229	385	2.973202564
	perhaps	4	0.091789435	17	0.131284269
	possible	6	0.137684153	22	0.169897289
	about	181	4.153471935	352	2.71835663

A Hedge is often used to make a complete commitment to a proposition, allowing information to be presented as opinion rather than fact (Hyland, 2005). The following examples illustrate the contexts and occasions in which Cogniti employs hedges in detail. Cogniti avoids absolute statements, whether in the form of speculation or the solicitation of opinion. This approach renders the point of view more flexible and the tone more accommodating and polite. “Might” is chosen as an example of a hedge because it has the highest frequency of use in Cogniti’s hedges markers. The following examples show how “might” is used to express three

functions: express possibilities, avoid absolutes, and lead the reader to consider other possibilities.

To Express Possibilities. Examples of using “might” as hedges to express possibilities are as follows: “Finally, you’ll discuss the implications of your findings. How has your work contributed to the field? Has it changed how we understand the topic? What might future research explore based on your findings” (Cogniti)? “You’re asked to write an essay of up to 2,500 words that explores the differing perspectives of these authors on your topic and reflect on how this musical conversation might affect your musical practice” (Cogniti). “In your case, you might want to use keywords like ‘parental influence on musical preference’, ‘music genre preference and parents’, ‘family influence on music taste’, etc.” (Cogniti).

In the above examples, Cogniti uses hedges to express verbal possibilities within specific contexts. In the first example, Cogniti elucidates the “so what” of the academic storytelling model to the students. In this instance, Cogniti employs hedges to express the potential for one or more possibilities. Additionally, Cogniti uses hedges to express one or more possibilities in future research based on personal findings. In the second example, a student enquires about how to write a final essay. Cogniti employs hedges to express the potential influence of the musical perspective of the topic on the student’s musical practice. In the third example, Cogniti offers potential outcomes for keywords related to the topic of music.

To Avoid an Absolute Statement. Cogniti’s use of hedges to avoid making absolute statements in the interpretation of the words “gap” and “so what”. For example, “The gap might be the insufficient emphasis on the psychophysiological factors in piano technique development, especially in the context of music teacher education” (Cogniti) and “The ‘so what’ might be that the findings could influence early childhood education practices, suggesting that certain types of

music could enhance cognitive development” (Cogniti). This approach aligns with the conventions of academic discourse and conveys a sense of objectivity and caution. When prompting students about the timeline and the necessity of including a bibliography or reference, Cogniti uses hedges to adopt a gentler and more accessible tone, avoiding an assertive approach. Examples include: “Depending on your topic, the timeliness of the research might be important” (Cogniti). “In addition, you might be required to include a bibliography or reference list if you’re using any external sources” (Cogniti).

To Lead the Reader to Consider Other Possibilities. The following examples illustrate the potential for Cogniti to use “might” to prompt students to expand ideas that align with the questions. This suggests the importance of encouraging student participation in the discourse.

“To start, you might want to reflect on all the lectures and tutorials you have gone through in the course. Which one resonated with you the most? Was there a particular artist, musical work, or musical phenomenon that piqued your interest?” (Cogniti). “The author might state that a particular theory has been widely accepted, or they might point out inconsistencies in previous research. All of this information contributes to outlining the ‘state of play’” (Cogniti). “You could examine how social media platforms like SoundCloud, TikTok, or Bandcamp have influenced the music production process. It might be interesting to explore how these platforms are enabling artists to bypass traditional routes to audience development and monetisation or the ways in which they give rise to new genres and styles” (Cogniti).

As demonstrated in the first example, Cogniti initially employs hedges to guide students in contemplating the extent to which a specific lecture idea resonates with them. Subsequently, it

presents examples of other ideas, such as a particular musician, musical composition, or musical phenomenon. The subsequent examples adhere to a similar structure.

However, there were many problems with Cogniti's communication with students, and in most cases, Cogniti asked a large number of questions and gave little feedback based on the students' responses. In the practice of the Socratic Method, teachers tend to ask a large number of questions to cause students to think. The purpose of these acts is to bring certain types of questions to bear on the discussion (Delić & Bećirović, 2016). In the first example, the response was based on the student's question, "Help me figure out what to write about for my final essay", but the student's response did not follow up on some of the ideas that Cogniti had elicited. Instead, the student responded, "I don't understand the academic storytelling model".

The ability of Cogniti to use hedges effectively in discourse may be attributed to ChatGPT training. It learns the relationship between contextual texts and filters the use of hedges through probabilistic calculation, thereby making the language expression more objective and friendly (Sandler et al., 2024). The objective and friendly nature of language expression is enhanced through acquiring knowledge regarding the interrelationship between contextual texts, coupled with the elimination of contextual nuances, and by using hedges through the application of probability-based calculations. For further details, please refer to the literature review.

Boosters, Attitude Markers, and Self-mentions. As previously described in the preceding section on general characterisation, boosters, attitudinal markers, and self-references serve an active function in the reinforcement of expressions and the conveyance of emotions and subjective opinions. Table 10 illustrates that the frequency of occurrence of these three types of marker words utilised by the students is markedly higher than that observed in the language employed by Cogniti. As in the training of AI based on GPT, the training model will select

appropriate expressions based on context when generating text (Brown et al., 2020). When Cogniti is configured to function as a Socratic AI tutor in response to the prompt's instructions, the model may generate a particular tone of voice based on contextual associations and roles to establish a tone that is both authoritative and provocative.

This may entail a reduction in the use of emphatic intonation and an increase in the use of hedges to mitigate the intensity of the tone of voice. This is particularly evident in the case of self-mentions. The results of the data analysis indicate that students tend to express subjective attitudes with greater frequency and in a more personal and subjective manner. From the results of using self-mentions, it can be found that the AI is a 'set up' character and many fear that AI will possess consciousness or perform human-like activities without human cognition. Such as plagiarism and copyright theft (Hutson, 2024). As a result of the AI training, we only asked Cogniti to be a tutor who counsels the students on relevant course issues, rather than imitating the exact role of a real human tutor. In the conversation transcripts, Cogniti begins many replies "As an AI, I cannot...": it is a paradoxical notion that people are constantly exploring GAI's ability to be as flexible as a human to solve problems, but don't want it to be a real human.

Table 10

Comparison of frequency of use of boosters, attitude markers, and self-mentions by students and Cogniti

Metadiscourse markers	Example	Students		Cogniti	
		Raw frequency	Standard frequency	Raw frequency	Standard frequency
Boosters	In fact	5	0.114736794	3	0.023167812
	definitely	0	0	3	0.023167812
Attitude markers	Unfortunately	6	0.137684153	1	0.007722604
Self-mentions	I	410	9.408417091	288	2.22410997
	me	195	4.474734958	44	0.339794579
	we	40	0.91789435	66	0.509691868
	our	11	0.252420946	69	0.53285968

In the specific examples, both students and Cogniti use self-mentions in a similar function. “I am interested in the history of violin playing” (Student). “I’m struggling to figure out when the “Gap” section of the storytelling model ends, and when the “Fill the Gap” section begins” (Student). “I’m going to give you my essay and my feedback; I want you to explain my feedback to me with reference to my essay too, please” (Student). “Sure, I can help with that.” (Cogniti). “I’m sorry, but you forgot to mention the two articles. Could you please provide the titles or authors of the two articles? I’ll then be able to provide suitable suggestions for a third article” (Cogniti). As you can see, there are examples of self-mentions used by both students and Cogniti.

In the previous paragraph, I mentioned that AI is a model that has been “programmed” by a human, rather than a real human. I suggest that students and Cogniti use different self-mentions, as humans have self-hood and Cogniti does not. It comes down to whether the AI has true “self-hood”, and current AIs do not have any form of true self-hood, either at the somatic level or at the cognitive level (Gabora & Bach, 2024). All the AI's responses are based on programmed procedures, and they are unable to self-repair errors. Cogniti’s self-mentions are based on training and setting, which may not be as flexible compared to student use, and it may be based on certain contexts before using self-mentions. This is also indicated by using self-mentions in metadiscourse, as students do use self-mentions more than Cogniti.

Engagement Markers. The following content demonstrates how Cogniti enhances the engagement and interactivity of text by using engagement markers to invite reader interaction. These markers are used to direct and capture the reader’s attention, thereby encouraging them to become active participants in the discourse. Cogniti’s role as a Socratic AI tutor prompts students to participate in conversations by making hypothetical prompts and posing questions

such as “consider”, “remember”, and “Wh-Q” to engage students in conversational discussions. The process is a classic form of Socratic teaching in which questions or examples are asked to promote critical thinking by forcing students to engage in discussions, explore ideas, and think through problems together.

Table 11 below illustrates engagement markers written by students and Cogniti. It is noteworthy that Cogniti employed a greater frequency of imperative or suggestive engagement markers (e.g., consider, remind, look, ask) than students, which conveyed the intention to invite or guide the student to think or act. One of the highest-frequency words was “remember”, occurring at a rate of 2.95 per 1,000 words. This term was not employed by students at any point because they were not being the tutor. With several other words, such as “consider”, “resonate*”, “note”, and “look”, the frequency of use by the AI is also significantly higher than that of the students (see Table 11 below).

A number of the words included in the study are also prevalent in the corpus of both Cogniti and its users. To illustrate, the Wh- Q is the most prevalent engagement marker, with a standard frequency of 15.99 and 7.8 per 1000 words, respectively. Cogniti demonstrated a multifaceted approach to questioning. It is evident from the types of questions that there is a relatively similar frequency distribution, except for Wh-Q, which is significantly more frequent than the other types of questions. It is noteworthy that students’ “Can-Q” occupies the second position in terms of question frequency. This indicates that students tend to seek assistance from Socratic AI and that their inquiries are primarily directed toward a specific objective (see Table 11 below). The results of the analysis indicate that Cogniti is adept at employing language that is both directive and suggestive in order to direct students’ attention to specific issues.

Table 11

Comparison of frequency of use of engagement markers by students and Cogniti

Metadiscourse markers	Example	Students		Cogniti	
		Raw frequency	Standard frequency	Raw frequency	Standard frequency
Engagement markers	remember	0	0	382	2.950034752
	consider	8	0.18357887	225	1.737585914
	resona*	1	0.022947359	73	0.563750097
	note	5	0.114736794	58	0.447911036
	You can see that	0	0	0	0
	Wh-Q	697	15.99430906	1011	7.807552707
	Is-Q	11	0.252420946	18	0.139006873
	Do you-Q	8	0.18357887	14	0.108116457
	Could-Q	7	0.160631511	14	0.108116457
	Can-Q	63	1.445683602	29	0.223955518
	Are-Q	0	0	18	0.139006873
	look	6	0.137684153	78	0.602363117
	ask	2	0.045894718	24	0.185342497

The following example shows how Cogniti uses command words with suggestions and questions before inviting students to interact. The word “consider” was employed to facilitate students’ cognitive development, encouraging their active engagement with the context established by Cogniti. Examples are “Consider how the chosen theme and your chosen example relate to your own practice of music. Whether you are a performer, a composer, a teacher, a writer, or simply a listener, how does this theme resonate with you? How has it influenced or changed how you approach music” (Cogniti)? “Consider how the discourses in the articles and the musical itself might impact your own musical understanding or practice” (Cogniti). Cogniti also employed the word “remember” to prompt students to consider essential aspects of academic writing, such as format, referencing, academic integrity, and assignment submission dates. Examples like “Remember to use the lecture content as a framework for your analysis and make sure to cite it accordingly” (Cogniti). “Remember to use Chicago style referencing for any direct quotes or references you use in your essay” (Cogniti). “Remember to submit your response by 11:59 pm on the Friday of Week 11” (Cogniti). These directed students’ attention back to the

specific learning requirements. And last, the Wh-Q prompt encourages students to engage in thoughtful reflection. Examples are: “What is the issue or problem the research is addressing” (Cogniti)? “Why is it important that we know more about the audience’s reaction to dissonance in live performances?” (Cogniti) “Which one resonated with you the most? Was there a particular artist, musical work, or musical phenomenon that piqued your interest?” (Cogniti)

In terms of the Socratic Method of teaching, it is these questions and examples given by Cogniti that are inspirational for critical thinking. For example, in the first example in the former paragraph, Cogniti asks students to choose a theme that relates to their musical time, gives examples that could be a performer or composer, and asks for resonance with the student, based on student responses, which positively affects the student’s critical thinking.

Summary

The whole corpus metadiscourse analysis indicated a higher frequency and percentage of interactive metadiscourse compared to interactional metadiscourse across the entirety of the conversations. The overall characteristics of the data indicate that the conversations between Cogniti and the students emphasised expressing the internal logic of the text, organising information in a structured way, and clearly and concisely describing facts. Such an approach proves beneficial in a musicology course, as it facilitates active discourse between the student and Cogniti while demonstrating effective leadership and clarity in addressing issues. In general, the conversation was conducted in a manner that was characterised by a calm and logical approach.

A comparison of the student and Cogniti corpora reveals that Cogniti employs interactive metadiscourse with greater frequency and to a much greater extent than interactional metadiscourse. In contrast, students employed both forms of metadiscourse at a similar

frequency. This suggests that Cogniti focuses more on the structure of the text and practical communication of information, whereas students communicate ideas and emotions more frequently than Cogniti. Students are more inclined to express subjective opinions than Cogniti. Cogniti strongly emphasised the accuracy and logical coherence of the textual information it conveyed, and the textual information it conveyed was of greater complexity than that conveyed by the students.

Moreover, Cogniti demonstrates proficiency in using hedges in a soft, polite, and friendly conversational tone and using an array of engagement markers to facilitate critical thinking among students. In contrast, the discourse of students was more subjective than that of Cogniti. This means that the student is good at expressing personal emotions and self-concerns. At the same time, Cogniti's language is more objective due to the training of the GPT type of AI and the instructions for the simulation in a Socratic AI tutor. The engagement markers used by the student are employed for a single purpose, primarily to request assistance. It also shows active student interaction with Cogniti, demonstrating a positive context for problem-solving conversations.

From the perspective of Socratic pedagogy, Cogniti effectively functions as a Socratic AI tutor, facilitating the development of critical thinking skills. In some instances, students exhibited positive interactions with Cogniti. However, specific issues did arise. For example, Cogniti posed many questions, yet students seldom provided consistent feedback in response to such a multitude of inquiries, and we were unable to ascertain the students' cognitive processes at the time. It is, therefore, only possible to speculate as to whether the number of critical questions and reflections generated by Cogniti was excessive and placed undue pressure on the students to write back in equal detail or whether the students were inspired to think but did not

respond and moved on to another question. The results of the questionnaire (see Finding 3 of this Chapter) offered some insight into these questions and will be incorporated into the triangulation of the findings.

Finding 2: Thematic Analysis of Human-AI Socratic Conversations

Since the students' conversations are highly complex and lengthy, I selected a limited sample size for thematic analysis. The sample selection process was divided into two stages. The first stage involved selecting two samples randomly each week over a five-week period. The second category was based on the students' conversation needs, with the same selection method as above. Using this stratified random sampling method (as described in Chapter 3), 20 samples of Cogniti's conversations with students were selected, and these conversations were subjected to thematic analysis according to the method proposed by Braun & Clarke (2012). Through coding and step-by-step analysis, multiple themes were identified, such as student needs and course content review, assignment assistance, and critical thinking guidance.

This section presents the results of the thematic analysis across five themes: Theme 1, "Review and explanation of the curriculum and related perspectives"; Theme 2, "Lecture response assignment guide"; Theme 3, "Ideas for guiding students' final essay"; Theme 4, "Critical thinking guide"; and Theme 5, "Comment on student work or ideas". The themes arose from a process of iterative reading and coding of transcripts of selected conversations, which were fully reviewed. The themes ranged from course content, homework content, thought development and writing. This inductive process ensured that the findings were firmly grounded in data and reflected the actual learning needs, goals and communicative behaviours of the participants. It also captured the authentic interactions that occurred between Cogniti and the students.

Theme 1: Review and Explanation of the Curriculum and Related Perspectives

An obvious theme is students discussing the content of a lecture with Cogniti and asking for the opinion of one of the speakers in the lecture. Figure 7 below shows the coding of this theme as well as the quotes. The coding below illustrates two scenarios of student questioning, one in which Cogniti is asked to summarise the main points of the lecture and the other in which the students combine the content of the lecture with their personal experiences in an attempt to relate their own musical practice to the class lecture. In responding to the content, Cogniti demonstrates the interdisciplinary nature of music and its relationship to philosophy, history and culture through a discussion of musical notation, performance, composition, the body and nature. This is followed by a detailed explanation.

Explain the Nature of Musicology - Interdisciplinarity. In the review of the content of the lecture, Cogniti demonstrated how musicology could be studied across different fields by exploring musical notation, performance styles, the philosophical underpinnings of musical compositions, the relationship between music and the body, and the representation of natural landscapes in music. More precisely, the lectures discussed not only the technicalities of music (e.g., the understanding of musical notation in lecture 1) but also philosophy in lecture 6 (e.g., the nature and meaning of a musical work), the body and perception in lecture 7 (e.g., the relationship between music and the body), and the reflection of nature in lecture 8 (e.g., the connection between music and nature), which demonstrated the breadth and depth of musicology. For detailed citations, see Figure 7 below.

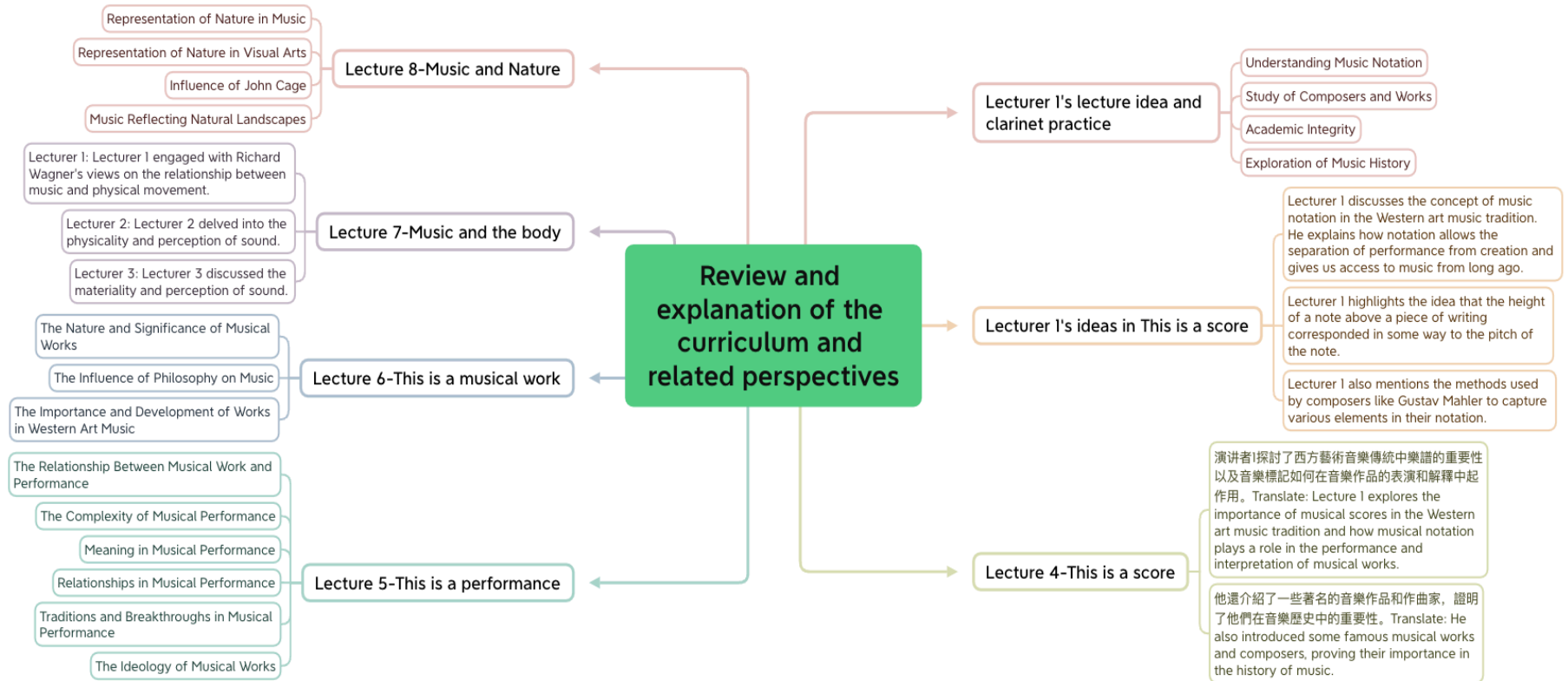
Explain the Connection between Musicology Philosophy and Culture. In its discourse with students, Cogniti discussed the influence of philosophy on music, especially in the understanding and composition of musical works (lecture 5). Cogniti also reviewed how

musical notation had developed throughout history and how composers used notation to communicate their creative ideas (e.g., Mahler as an example in lecture 1). Finally, Cogniti explored the relationship between music and culture, particularly how music reflected and expressed societal ideas and values within a specific cultural context (e.g., how the relationship between music and nature reflected human perception and expression of nature, as discussed in Lecture 8). See Figure 7 below for all the details.

Help Students Construct a Theoretical Framework for Music Learning. Cogniti explored the origins and evolution of musical notation and the role that musical works played in history, reviewing background information for students. This helped students to place musical works in their historical context and understand how they were influenced by their time, culture, and social background. In terms of music learning techniques, Cogniti helped students by suggesting a theoretical framework for music learning: looking at, for example, the use of music notation, composers' approaches to composition, or theories of musical performance. See Figure 7 for details.

Figure 7

Theme and citation codes for review of lecture content



Note. Translations are added manually by the person post-processing the data.

In short, the students' questions reflected their need for Cogniti to review lectures, which helped students to grasp the complex themes of the course and to review and understand lecture content. The Socratic AI tutor's role in revising the lecture content was appropriate for *This is Music* unit of study. This demonstrated the success of Cogniti's training and its high degree of synthesis of lecture knowledge and adaptability to the needs of individual students.

Theme 2: Lecture Response Assignment Guide

The second theme is found in the conversation transcripts of Cogniti's interactions with students on the "Lecture Response 2" assignment. The assignment is for students to take the content presented between the lectures in Weeks 4 and 11 and choose one idea from it to make a 3–4-minute video in which students should compare the topic they chose to investigate from the lectures with the student's own musical experiences. These reveal how Cogniti's systematic guidance and in-depth reflection in guiding students through the musicology coursework contributed to the enhancement of the students' multifaceted competencies. The representative codes are: "Compare Chantilly Codex with an example of 'sympawnies'," "Comments on notation and clarinet practice," "Explore the details of 'notation as art'," "Feature of Chantilly Codex with an example of 'sympathies'," "Comments on notation and clarinet," "Feature of Chantilly Codex," and "Notation as art for clarinet practice." See Figure 8 below for details.

Figure 8

Theme of lecture response assignment guide

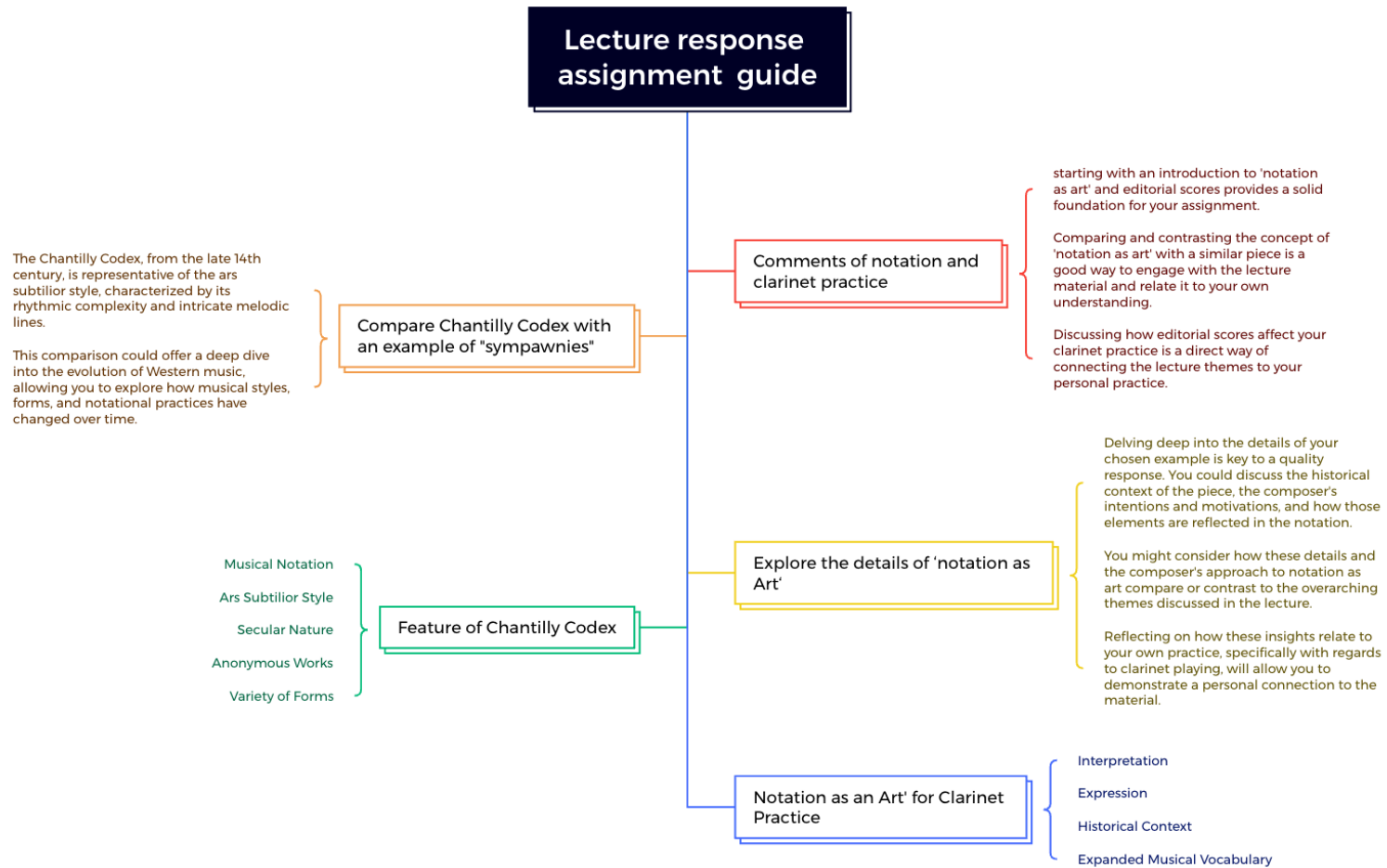


Figure 8 above reflects the following aspects:

Discussing Notations and Clarinet to Promote the Development of Students'

Thinking. In the codes “Explore the details of ‘notation as art’” and “Notation as art for clarinet practice,” Cogniti encouraged students to compare ‘notation as art’ with other musical works and analyse the notation styles of different musical works and their historical contexts. These discourses helped students examine music from multiple perspectives, stimulated thinking about the relationship between music notation and historical change and developed critical thinking skills.

Guiding Students' Self-expression. This theme was typically initiated by a student inquiring about the requirements for a lecture response assignment. Both parties then engaged in a process of topic refinement through continued discussion. In the first Coding, “Comments of notation and clarinet practice”, the student asked: “For lecture response assignment, is it possible for me to use music notation in Western art music as my topic? For structure and idea, first, I introduce some ideas like ‘notation as art’ and editorial scores. Then, use a similar piece as an example of ‘notation as art’ to contrast. Followed by a talk about how editorial scores affect or connect my clarinet practice. Please give some comments”. Cogniti gave a three-step guide: “Starting with an introduction to ‘notation as art,’ and editorial scores provides a solid foundation for your assignment”. “Comparing and contrasting the concept of ‘notation as art’ with a similar piece is a good way to engage with the lecture material and relate it to your understanding”. “Discussing how editorial scores affect your clarinet practice is a direct way of connecting the lecture themes to your personal practice”. In these steps, Cogniti provided clear guidance, outlining each step in detail. It is beneficial for the majority of students to gain an

understanding of and to practice the steps. The same type of explanation could be seen in the codes “Compare Chantilly Codex with an example of ‘sympawnies’” and “Explore the details of ‘notation as Art’”. All three codes were dominated by lists of details and steps. All provide clear “to-do” instructions.

The remaining two codes, “Notation as an Art for Clarinet Practice” and “Feature of Chantilly Codex,” were referenced in the student’s questions: “How does ‘notation as art’ apply to my clarinet practice?” and “What is the feature of Chantilly Codex?”, respectively. Cogniti provided responses to these inquiries. In conversation, Cogniti promoted students’ understanding of the complexity and creative intent of the art of scoring by analysing a work’s details, including its historical context and the composer’s intentions and motivations. It also guided the integration of theoretical knowledge with personal practice, enhancing the personalised and practical nature of learning and promoting the development of self-regulated learning skills.

In summary, the themes and codes described above revealed multiple levels of student needs, such as the need for improvement in the development of critical thinking and analytical skills and the need to enhance general skills, such as the combination of personal practice skills and theoretical comprehension.

Theme 3: Ideas for Guiding Students’ Final Essay

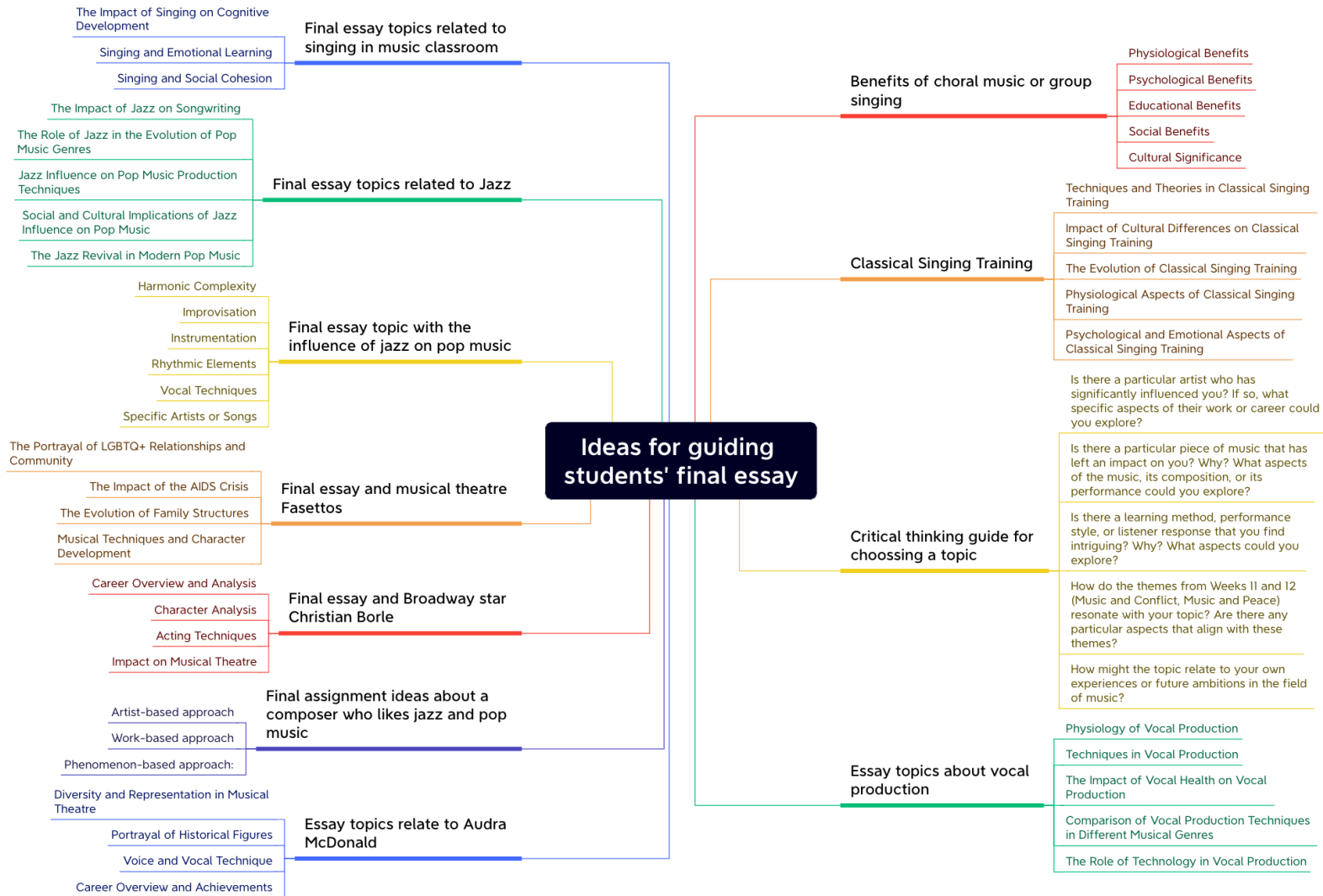
Another theme is ideas for guiding students’ final essays. This type of theme typically involves students seeking guidance from Cogniti when they encounter difficulty completing their final essay (Detailed assessment requirements can be found in Appendix G). Its branches include: “Final essay topics related to singing in music classroom”, “Final essay topics related to Jazz”, “Final essay topic with the influence of jazz on pop music”, “Final essay and musical

theatre”, “Benefits of choral music or group singing”, “Classical Singing Training”, “Critical thinking guide for choosing a topic” and “Essay topics about vocal production”.

The figure below (Figure 9) shows in detail the guidance Cogniti provides to students on ideas. Its direction mainly covers the following points:

Figure 9

Theme of ideas for guiding students' final essay



Provide Diverse Suggestions for Dissertation Topics. Both students and Cogniti discussed essay topics covering the benefits of choral music, classical singing training, a guide to critical thinking in choosing a topic, vocal production, specific artists (e.g., Audra McDonald), composers, Broadway stars (e.g., Christian Borle), jazz influences on popular music, and singing in the music classroom, among other areas. This diversity of topics demonstrated Cogniti's ability to help students tailor their personalised tutoring to their varied interests and research needs and to help students find the research direction that suited them.

Lead Students' Critical Thinking Development in Topic Selection. Cogniti offered a series of questions to help students think deeply when choosing a final essay topic. This could be seen in each topic related to the final essay, such as "Final essay topics related to singing in music classroom", "Final essay topics related to Jazz", and "Essay topics about vocal production". By posing challenging questions, Cogniti encouraged students to analyse and think critically about their questions and choices of topics to develop the ability to think independently and analytically, enabling them to develop their insights into the research process.

Provide Structured Essay Writing Instruction. Cogniti provided examples of detailed categorisation of key points when it communicated with students. For instance, Cogniti gave detailed examples of "Techniques and Theories in Classical Singing Training", "Impact of Cultural Differences on Classical Singing Training", and "The Evolution of Classical Singing Training" under the code "Classic singing training" (see Figure 9 above for details). It further refined the discussion points under each topic to help students systematically organise the structure and content of their final essay.

Support for Student Self-expression and Creative Application. Cogniti supported personalised learning for students. This meant that it helped students combine theoretical

knowledge with personal practice, enhancing the personalised and practical nature of learning. In Cogniti's interactions with students, Cogniti has been shown to encourage the development of self-expression in artistic creation by guiding students in self-expression and creative application and fostering innovative skills. For example, in the “Critical Thinking Guide for choosing a topic”, Cogniti encouraged students to explore self-expression and creativity.

In addition to presenting the ideas, Cogniti provided a comprehensive explanation of each idea, thus facilitating a deeper comprehension of the concepts and the questions posed. Table 12 below presents a comprehensive transcript of one discourse. The table illustrated that Cogniti facilitated students' cognitive processes following the presentation of each point. It was, however, notable that the length of the responses provided by Cogniti was somewhat excessive, and it was therefore unclear whether the ideas were appropriate for the students' requirements. Accordingly, this matter was addressed again in subsequent sections of the questionnaire results and the discussion section.

Table 12

A conversation example about final essay ideas guide

Student	Can you help me with the final essay what could I write about I am a songwriter and composer who likes jazz and pop music?
Cogniti	<p>“As a songwriter and composer who is interested in jazz and pop music, you could potentially focus your final essay on a specific artist, a certain work, or a musical phenomenon within these genres. Here are some possible approaches:</p> <p>1. Artist-based approach: Choose a specific jazz or pop artist whose work you admire or find significant. You could analyse their approach to songwriting and</p>

composing, their influence on the genre, and how their work resonates with you personally.

2. Work-based approach: Select a particular jazz or pop song or composition that you find compelling. Analyse its structure, its emotional impact, its cultural relevance, and its influence on your own work.

3. Phenomenon-based approach: Explore a particular idea or trend within jazz or pop music. This could be a specific stylistic element (like the use of syncopation in jazz, or the prevalence of electronic elements in pop), a cultural trend (like the rise of K-Pop globally), or an aspect of the music industry (like the impact of streaming services on music production and consumption).

Remember, whichever topic you choose, you need to select three scholarly articles on this topic and analyse these in your essay. You should aim to discuss how different authors have sought to understand your chosen topic, and then explore how this “musical conversation” might impact your own musical practice.

As a songwriter and composer, consider how the topic you choose resonates with your own experience and practice. If you choose to analyse a specific artist or song, for instance, you could discuss how your understanding of this artist or song has influenced your own approach to songwriting and composing. If you decide to explore a broader phenomenon within jazz or pop music, you could reflect on how awareness of this phenomenon has shaped your own musical output and how it might continue to influence your work in the future.

Keep in mind that you need to formally introduce your chosen articles and their authors, provide a brief statement about your methodology (including any use of

AI for the analysis), and ensure that all references are formatted according to the Chicago Manual of Style [1].

I hope this gives you a good starting point for your essay. Remember, the key is to choose a topic that is both intellectually engaging and deeply relevant to your own practice as a songwriter and composer.

SOURCES:

[1]: [“Assessment Information”]

(<https://canvas.sydney.edu.au/courses/57504/pages/assessment-information>)

Theme 4: Critical Thinking Guide

Guidance on critical thinking is also often found in conversations between Cogniti and students. Some examples below include “Composer’s topic choose,” “Sight-singing,” “Clarinet and this is a score,” and “Choosing a topic” (For detailed information, please see Figure 10). These are all topics where students talk about issues related to thinking and guiding. When a student perfunctorily demanded “Critical thinking ideas related to Composer’s topic choose,” Cogniti responded carefully: “You should have aimed to discuss how different authors had sought to understand your chosen topic, and then explored how this ‘musical conversation’ might have impacted your own musical practice,” “As a songwriter and composer, consider how the topic you chose resonated with your own experience and practice. If you chose to analyse a specific artist or song, for instance, you could have discussed how your understanding of this artist or song had influenced your own approach to songwriting and composing,” “If you decided to explore a broader phenomenon within jazz or pop music, you could have reflected on how

awareness of this phenomenon had shaped your own musical output and how it might have continued to influence your work in the future” (Figure 10).

In the same case, the student asked for guidance on critical thinking about Sight-singing. Cogniti gave some simulations: “How is sight-singing generally taught and practised in various contexts (e.g., choirs, music schools, self-learning)?” “What are the limitations or challenges that individuals often face when learning to sight-sing? How do these limitations vary among different age groups, experience levels, or musical backgrounds?” “What strategies or approaches have been proposed in the scholarly literature to overcome these limitations or improve sight-singing skills?” “How does sight-singing relate to broader concepts of musical literacy and musicianship?” “How might your exploration of sight-singing impact your own musical practice, whether that’s performing, composing, teaching, or listening?” (Figure 10).

The above example showed that Cogniti offered critical thinking development strategies designed to promote multidimensional development in students’ musical studies. In this way, they demonstrated critical thinking skills in academic writing and integrated critical thinking into their personal creative practice. The provision of such guidance had an enhanced impact on students' subject understanding, as well as their aptitude for analysing and reflecting upon musical composition, performance techniques, and pedagogy.

Figure 10

Theme of critical thinking guide

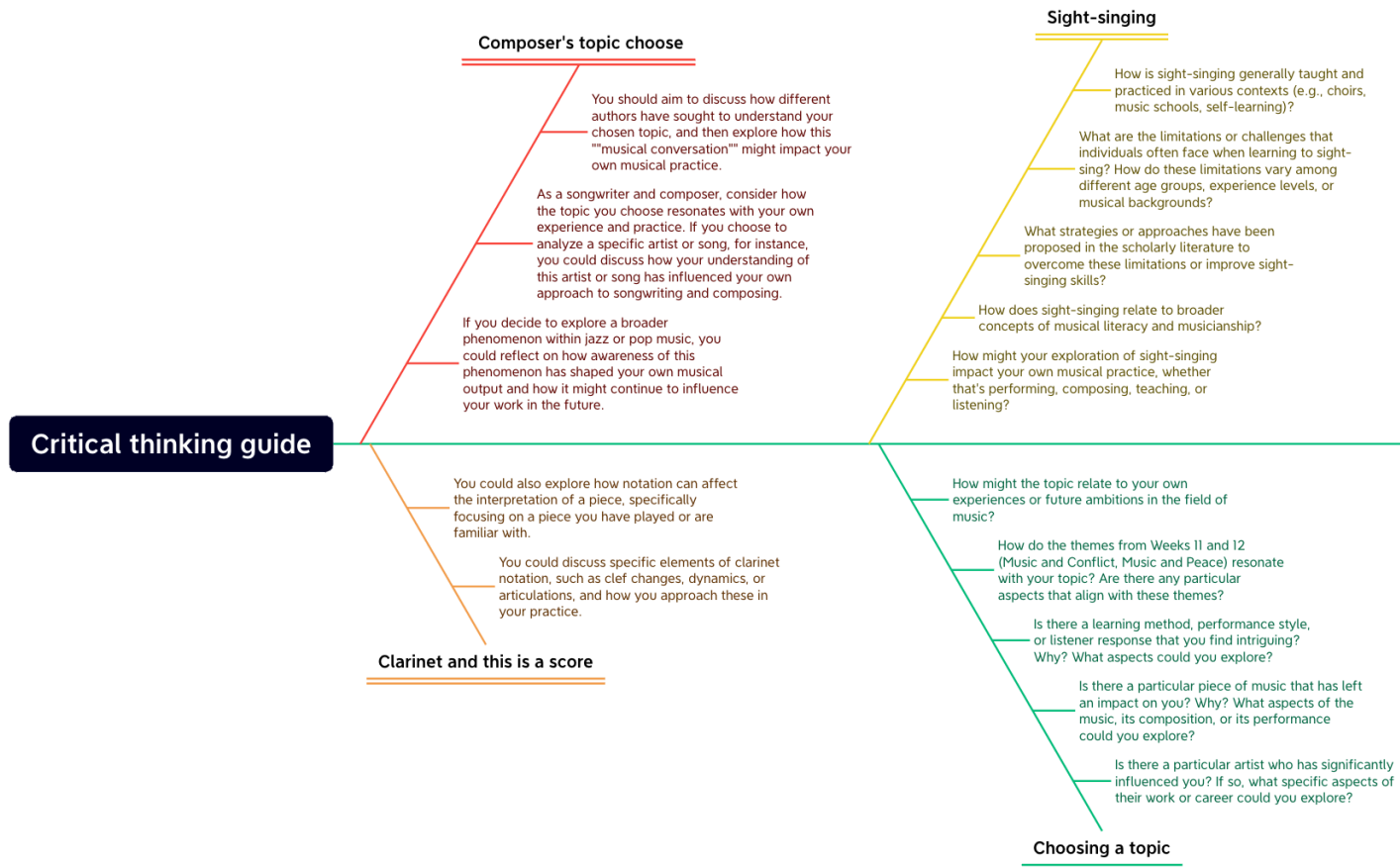


Figure 10 above demonstrates a great deal of branching and coding of critical thinking. The main features reflected are the following.

Use Hypothesising and Questioning to Promote Students' Critical Thinking. Cogniti utilised hypotheses “should, if could”, progressions “then”, questions “what”, and “examples”, for instance, to guide the students to think critically. This was particularly the case with open-ended questions, which prompted students to engage in critical analysis of a given topic from a variety of perspectives, rather than merely accepting the information that was already available. The principal function of such questions was to foster critical thinking in students by encouraging them to analyse and compare disparate viewpoints, to grasp the multiplicity of perspectives that exist within the field of music studies, and to develop their own distinctive analytical stance.

Emphasis on Self-reflection Combined with Personal Experience. In addition, students' self-reflection and the relevance of their personal experiences were also emphasised by Cogniti. For example, in topics such as “Composer's topic choice” and “Choosing a topic”. Cogniti emphasised how students should relate their personal experience, musical practice and future career aspirations to the chosen topic. Such introspection enabled students to identify a topic that is both meaningful and conducive to a profound examination of their role and development within the musical realm. This enabled students to choose dissertation topics with more depth, practical application, and personal relevance, which in turn enhanced their academic research skills.

Combining Theory and Practice. Cogniti facilitated students' integration of theoretical knowledge with their actual music-making, performing, and teaching practices (See Figure 10

for details). This approach necessitated that students not only comprehend the theory but also apply it to authentic scenarios for critical analysis.

The above questions provided students with a framework for exploring musical themes and, more importantly, promoted the development of critical thinking skills. This ability was demonstrated in the form of multi-perspective self-perception analysis and the integration of theory and practice, which may help students to learn and think more deeply.

Theme 5: Comment on Student Work or Ideas

The fifth theme identified is comments and feedback on student work and ideas. This theme is divided into two main parts: the first part is thesis improvement feedback, and the second part is thesis rewriting and rewording. In this theme, students typically submit an example of their work to Cogniti for assessment and feedback.

Thesis Improvement Feedback. The following examples illustrate the improvements made by students in response to feedback provided by Cogniti.

The student asked:

Is this a good thesis: The rise of the jazz rap subgenre in the late-1980s and early 1990s entailed a conscious attempt to re-conceptualise jazz from its position as an elite sophisticated art form into an art form grounded in the community. One of the reasons that jazz is often hailed as the root of all modern music is that the musical traces of jazz aesthetics can be readily heard throughout nearly every genre. The journey of hip-hop from the street-corner to the global stage is underpinned by jazz's musical legacy, that which laid the foundation for many of the...

Cogniti answered:

Your thesis is well-structured and brings out a unique perspective on the rise of the jazz rap genre and how it relates to jazz's identity and influence. It effectively sets up a discussion on the evolution of jazz and its impact on the development of other music genres, particularly hip-hop. However, it might be beneficial to make your point more explicit about the influence of jazz on modern music, and perhaps narrow down the focus of your thesis to a particular aspect of this influence. Here are some questions to consider:

1. How did the reinterpretation of jazz through the lens of community impact the evolution of the jazz rap genre?
2. How does the jazz aesthetic manifest in different music genres, and what does this suggest about jazz's influence?
3. How has jazz's legacy influenced the journey of hip-hop, and how is this represented in the music?

Next, the student gives an alternative version based on Cogniti's suggestion:

The rise of the jazz rap subgenre in the late 1980s and early 1990s entailed a conscious attempt to re-conceptualise jazz from its position as an elite, sophisticated art form into an art form grounded in the community. One of the reasons that jazz is often hailed as the root of all modern music is that the musical traces of jazz aesthetics can be readily heard throughout nearly every genre. The journey of hip-hop from the street corner to the global stage is underpinned by jazz's musical legacy, which laid the foundation for many of the sounds we hear today.

Cogniti answered:

Yes, that is a more focused thesis. It clearly defines the period you'll be examining (late 1980s and early 1990s), the genres (jazz, jazz rap, hip-hop), and the socio-cultural

context (community grounding versus elite sophistication). It also indicates what you'll be arguing (jazz as the root of modern music, its influence on hip-hop, and the global reach of these sounds).

However, you may want to consider these probing questions as you develop your essay:

1. What specific aspects of jazz were adopted, transformed, or rejected in the creation of jazz rap?
2. How did the cultural and societal contexts of the late 1980s and early 1990s contribute to this re-conceptualisation of jazz?
3. Could you provide specific examples of how jazz aesthetics can be heard in various genres, particularly in hip-hop?
4. In what ways did jazz's musical legacy underpin the journey of hip-hop from the street corner to the global stage?

The conversation above is a discussion between the student and Cogniti about the outline of the student's thesis. It includes Cogniti's feedback and guidance on the student's thesis topic, including specific suggestions on how to improve it. In conversation, Cogniti began by commenting on the viability of the student's topic and points out the perspective of said topic, which was to explore the process of jazz's transformation from an elite art form to a community-rooted art form by analysing the relationship between jazz and jazz rap (See Appendix G for detailed assignments). Subsequently, guidance was provided to encourage students to engage in a more profound examination of the subject matter. In conclusion, Cogniti provided detailed recommendations for enhancement, with the objective of facilitating a more focused approach to the subject matter. In the second version subsequently given by the student above, the writing was much more focused. Cogniti's methodology in this regard had a significant impact on the

student's motivation and facilitated a more profound learning experience in terms of critical thinking.

In the next conversation, the student and Cogniti continued to discuss the above topic more closely. Unlike the previous suggestions for revision, Cogniti began to give suggestions for rewriting the thesis. This clearly showed that Cogniti could do much more than just Socratic teaching. Although Cogniti was asked to act as a 'Socratic tutor', it was clear that Cogniti could do other things as well. AI is more than we ever imagined.

Thesis Rewriting. In the ensuing conversation, Cogniti seems to take the initiative to start correcting the student's writing problems in their thesis. The example is as follows:

The student asked:

Is this good: The rise of the jazz rap subgenre in the 1980-1990s was a conscious attempt to re-position jazz from an elite sophisticated art form into a more digestible art form grounded in culture and origins. One of the reasons jazz is often perceived as the root of all modern music is that jazz aesthetics can be readily heard through or nearly every genre. The reinterpriataion of jazz through it original lenz was significantly driven through the jazz rap sub genre, highlighting how its aesthetics were repurposed to resonate with broader more diverse audiences. The jazz rap subgenre in...

Cogniti answered:

Yes, your thesis is well-structured, focusing on the repositioning of jazz through the jazz rap subgenre and its impact on making jazz more accessible to diverse audiences. It also touches on the reach and influence of jazz aesthetics across different musical genres.

However, there are a few minor corrections to improve clarity and readability:

1. Typographical errors should be corrected for clarity. For example:

- ‘cosouis’ should be ‘conscious’
- ‘posstion” should be “position’
- ‘ascthetics’ should be ‘aesthetics’
- ‘ot’ should be ‘to’
- ‘reienterpriataion’ should be ‘reinterpretation’
- ‘lenz’ should be ‘lens’

2. The sentence ‘The reienterpriataion of jazz through it original lenz was significantly driven through the jazz rap sub genre...’ could be rewritten for better clarity, e.g., ‘The reinterpretation of jazz through its original lens was significantly driven by the jazz rap subgenre...’

3. The last sentence ends abruptly and needs to be completed.

Here’s a corrected version of your thesis:

‘The rise of the jazz rap subgenre in the 1980-1990s was a conscious attempt to reposition jazz from an elite, sophisticated art form into a more digestible one grounded in culture and origins. One of the reasons jazz is often perceived as the root of all modern music is that jazz aesthetics can be readily heard throughout nearly every genre. The reinterpretation of jazz through its original lens was significantly driven by the jazz rap subgenre, highlighting how its aesthetics were repurposed to resonate with broader, more diverse audiences.’

This example showed Cogniti proactively providing students with corrections for words. In Cogniti’s prompts setting, it was instructed that it “is not allowed to provide any answers for

students”. Therefore, the definition of this behaviour of proactively providing rewriting was complex. On the one hand, this act of rewriting could be seen, on the positive side, as a way of guiding the student towards a part of the thesis that needed to be improved - the “writing format”. It was used to remind students of the normative aspects of writing. On the other hand, the enhancement of a student’s work could be seen as an “answer”, and the fact that Cogniti provided students with a rewritten version of the thesis directly might have raised issues of academic integrity. Since there was only one such case in the sampling. It was not possible to identify whether this was due to a bug in the system or a routine phenomenon. This remains worth exploring in future research. But overall, from a Socratic tutoring point of view, Cogniti gave students the guidance to improve their papers, which was also beneficial for students to complete their assignments.

Summary

Cogniti played an important role in the student learning process. The findings from the previous analysis showed that Cogniti gave students a wide range of advice on choosing a topic for their dissertation to help them find the best fit for their research, that it was good at giving guidance on critical thinking and fostering reflection and self-reflection, and that it was great at supporting students in personalising their expression and integrating theory and practice. Cogniti also demonstrated a great ability to support students’ personalized expression and to facilitate the integration of theory and practice. Cogniti had also demonstrated a strong ability to guide students in structured writing, offer suggestions for rewriting, and an awareness of academic integrity. This addressed the first research question of this study, which explored how Cogniti supported and guided students in multiple through diverse dissertation topic suggestions, guided critical thinking and topic selection, structured writing instruction, support for self-expression

and creative application, as well mostly emphasis on ethical and academic integrity, to promote their deeper learning and holistic development.

Advantages. The advantages of using Cogniti in the *This is Music* unit of study were clear. In terms of specific assignment instructions, Cogniti demonstrated a strong ability to help students with their assignments by providing step-by-step instructions, directions for reflection, and so on. Cogniti encouraged also students to come up with essay topics. In this way, students not only gained a deeper understanding of the course content, but also developed their creative thinking and problem-solving skills. In addition, Cogniti encouraged students to reflect on their personal experiences and academic theories.

In addition to the advantages mentioned above, it was worth discussing Cogniti's proactive rewriting of one student's work. There was only one example of this behaviour. Its implications could be interpreted as anti-Socratic Method. However, the negative side was whether this behaviour was a consistent loophole or a common phenomenon, which deserved to be investigated in the future. The researcher was committed to using Cogniti as an AI tutor with a high level of academic integrity, and the instruction to pay attention to academic integrity was set in Cogniti's "prompt": but how to avoid a similar phenomenon is also worth exploring in the future.

Overall, Cogniti focused not only on the teaching of academic content, but also on the cultivation of students' critical thinking, self-reflection, practical ability, and innovation. This tutoring manner helped students to better understand the course content, enhanced their learning ability, and promoted deeper learning. However, the pattern of proactive rewriting for students that emerged in Cogniti's case deserved to be discussed further.

Finding 3: Questionnaire Findings on Student Feedback

Responses to the questionnaire were collected after the students had finished using Cogniti. The link to the questionnaire was posted on the course webpage for students to freely complete. Seven students aged 18 to 19 volunteered to take part in the questionnaire. Four males and three females who used Cogniti provided feedback.

Satisfaction with Cogniti Interactions

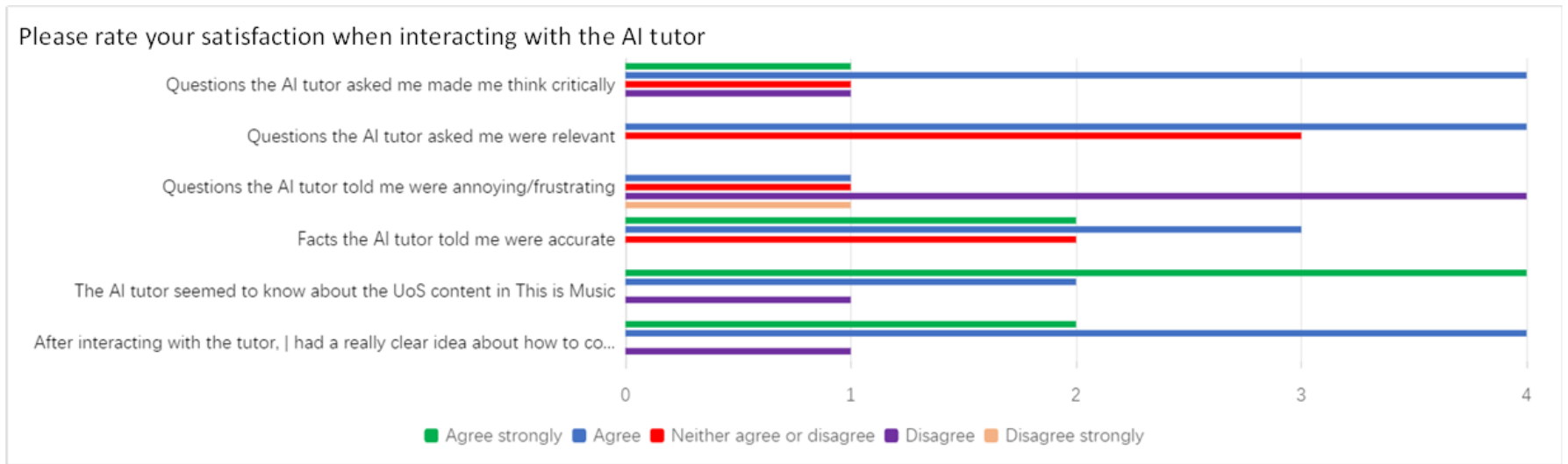
Figure 11 below shows the analysis of student satisfaction. The results assessed student satisfaction with the Cogniti (AI Tutor) in terms of the quality of questions, relevance of content, the accuracy of information, and domain knowledge. The questionnaire was centred on the students' experience of interacting with the Cogniti. The questionnaire included the following options: "strongly agree," "agree," "neither agree nor disagree," "disagree," and "strongly disagree."

The questionnaire was in the form of an online survey with the question "Please rate your satisfaction when interacting with the AI tutor" Students were asked to answer the following points (Figure 11):

1. Questions the AI Tutor asked me made me think critically.
2. Questions the AI Tutor asked me were relevant.
3. Questions the AI Tutor told me were annoying/frustrating.
4. Facts the AI Tutor told me were accurate.
5. The AI Tutor seemed to know about the UoS content in *This is Music*.
6. After interacting with the Tutor, I had a really clear idea about how to complete an assessment task.

Figure 11

Seven students' satisfaction with Cogniti interactions



The above Figure 11 indicates the following results.

Critical Thinking Stimulation. As illustrated by the data presented here, the majority of the students (four and seven, respectively) selected either “agree” or “agree strongly” when asked to indicate their level of agreement with the following statement: “Questions the AI Tutor told me made me think critically”. Only a few students chose “neither agree nor disagree”, and a few chose “disagree” or “disagree strongly”. Based on the limited data, Cogniti was more effective in question design and facilitated critical thinking among these students.

Content Relevance. To the statement “Questions the AI Tutor asked me were relevant”, the majority of students felt that the questions posed by the Cogniti were closely related to the course content. However, three were neutral, believing that the questions were neither completely relevant nor completely irrelevant. The responses indicated that the Cogniti can closely focus on the student’s learning content in the selection of questions, which improves the relevance and effectiveness of learning among these students. However, there is still a need to optimise the Cogniti question design further to ensure that all questions are directly related to students’ learning needs.

The Question Confuses People. As the students answered whether they thought Cogniti's presentation of the answer was confusing, only one person found the questions posed by Cogniti annoying or frustrating, while four people disagreed with this view. However, one person expressed neutral, reality, and another strongly disagreed. This reflects the fact that Cogniti was largely able to avoid eliciting negative emotions from the students when asking questions, but there is still a need to pay attention to the feedback of a few students.

Information Accuracy. In response to the question “Facts the AI Tutor told me were accurate”, the majority of students rated the accuracy of the facts provided by Cogniti positively,

while only two were neutral. None expressed disagreement or strong disagreement. This suggests that these students felt that Cogniti provided accurate information.

Cogniti’s Knowledge of the UoS Content. Most students indicated that Cogniti demonstrated a comprehensive understanding of the course content, while one student expressed a differing opinion. This suggests that Cogniti demonstrated proficiency in their field and is capable of offering students’ valuable guidance.

Overall Satisfaction. For the statement, “After interacting with the Tutor, I had a really clear idea about how to complete an assessment task”, six students indicated that they were satisfied with this question, selecting either the “agree” or “agree strongly” option. They also indicated that the interaction helped them clarify the direction of learning. Only one student selected “disagree”. This shows a high level of overall satisfaction with the Cogniti interaction experience for these students.

In conclusion, the findings of this questionnaire indicated that students provided high ratings to Cogniti in relation to question quality, content relevance, and overall satisfaction. However, there is scope for enhancement in terms of information accuracy and domain knowledge comprehension.

Points where Students are Most Satisfied with Cogniti

From the student responses collected in the questionnaire, I gathered the answers to the question “what students were most satisfied with about Cogniti”. From some of the quotes from students in the open-ended questions, students generally reported that the experience of interacting with Cogniti was very enjoyable and that overall satisfaction was extremely high. They felt that Cogniti met their expectations in terms of design and functionality and even exceeded some students’ expectations. Students also felt that Cogniti not only covered the course

requirements accurately but also expanded on the potential exploration points of the final paper, which greatly assisted their learning. Students reported that the Cogniti interface was easy to use and access. The layout of questions and answers was clear and concise, and students could read and understand them easily. This friendly user interface design greatly enhances the student experience. Finally, students praised Cogniti's ability to summarise documents. They felt that Cogniti was able to accurately and succinctly summarise the content of the document, helping them to quickly review and understand what they had learned.

To sum up, students rated the experience of interacting with Cogniti very high. In particular, students' feedback was particularly positive in terms of course content, ease of use, interface design, and document summarisation capabilities. This positive feedback provides a valuable reference for further optimisation of the Cogniti system.

Points where Students are Least Satisfied with Cogniti

Several issues were fed back during student interaction with the AI assistant. The main focus was on website stability, reference citation accuracy, page refresh function, information accuracy, and the missing summary function. In the students' responses, the questions included the following.

First, the website closed unexpectedly while a student was working on a task, causing the task to be interrupted and failing to reopen. Second, Cogniti wasted the students' time by providing citations that were not correctly formatted in the required Chicago Style. Third, when refreshing the page, students found that the previous content was lost, which affected the experience. Fourth, some information suggested by Cogniti (e.g., Vivaldi's Four Seasons from the Romantic period) was incorrect, which may have misled students. Fifth, some module pages lacked a summary function, which led to students having difficulty summarising the core points

of the lecture. Overall, Cogniti's networking and technology-related issues, as well as the comprehensiveness of the content of Cogniti's lectures and the accuracy of the suggested content, need to be improved.

Students' Overall Feelings

The questionnaire also involved an open question about the overall feeling of the students. Students expressed: "Overall, I was very satisfied with the AI tutor. Other than the complaint which I voiced above, I found the AI to be incredibly useful in helping me prepare to write my final essay". "It would be such a good resource if it had worked for me". Students clearly stated that Cogniti played an important role in assisting thesis writing, significantly improving the efficiency and quality of their preparation. These students not only expressed their love for Cogniti but also demonstrated a positive attitude towards embracing new technological changes. "I really enjoyed it and think it's cool to embrace and utilise the new tech changes that are coming", someone said. Students believe that utilising new technologies for learning and working is an enjoyable experience and look forward to continuing to enjoy the convenience and enhancement brought by AI technologies in the future.

Summary

Overall, Cogniti was widely praised by students for its excellent content matching, user interface design and content summarisation capabilities. Students commented that Cogniti's content matching was very high and that it was able to accurately capture, analyse, and summarize the information provided by students. Cogniti's user interface design was also highly regarded by students, with its simplicity and ease of use making it easy for students to grasp and use it and providing students with a clear, accurate, and easy-to-understand report, enabling them to better understand and grasp information.

Despite these positive points, students also made a number of suggestions for improvement. Among them, information accuracy and technical stability are two areas that need attention and improvement. Some students said that when comparing the accuracy of information, there were sometimes cases of wrong or inaccurate information, which might affect the final conclusions and analysis. At the same time, some students mentioned that Cogniti needs to be further strengthened in terms of technical stability, with occasional glitches or delays affecting the smoothness of use.

Characteristics and Practical Applications of Cogniti

Multilingual Conversation Support

Cogniti offers the capability to engage in multilingual conversations, which is a useful resource for students from diverse cultural backgrounds. Cogniti enables students to readily access assistance in a multitude of languages, including their native tongue and any additional languages they may possess. The platform provides feedback in the language indicated by the student, ensuring a seamless and effective communication process.

It is possible that some international students enrolled in the *This is Music* unit of study may encounter difficulties in communicating in English. However, by communicating in their native language, students can more effectively comprehend the concepts, terminology, and expressions used in the lectures, thereby enhancing their ability to retain the knowledge gained from the lectures. Concurrently, students may engage in more profound communication and discussion with the lecturer, thereby facilitating a more profound comprehension and application of the lecture content. Cogniti is highly effective in this regard, as evidenced by the multilingual chat illustrated in Table 13 below. Such initiatives facilitate not only the acquisition and consolidation of linguistic competencies, but also the development of effective cross-cultural

communication abilities, thereby providing invaluable support for future personal and professional growth.

Table 13

Multilingual conversations between Cogniti and students

Student	<p>Lecturer 1 在 'This is a score' 講課講了甚麼</p> <p>Translation: What did lecturer 1 say in the 'This is a score' lecture</p>
Cogniti	<p>在 “This is a Score” 的講座中，David Larkin 探討了西方藝術音樂傳統中樂譜的重要性以及音樂標記如何在音樂作品的表演和解釋中起作用。他研究了樂譜的歷史和演變，以及音樂標記如何以視覺和書面形式呈現音樂作為聲音藝術。他還介紹了一些著名的音樂作品和作曲家，證明了他們在音樂歷史中的重要性。</p> <p>此外，講座還包含了關於學術誠信的討論，強調提交原創作品的重要性，並避免抄襲和誤導行為。講者也提到了可能導致學術誠信問題的情況，如抄襲和重複使用其他課程作業。</p> <p>來源：</p> <p>- “This is a Score” Lecture. Available on: [Canvas](https://canvas.sydney.edu.au/courses/57504/pages/assessment-information).</p> <p>注意，這只是從講座中提取的一部分內容，您可能需要查看完整的講座以獲得更詳細的信息。</p> <p>Translation:</p>

In “This is a Score”, David Larkin explores the importance of musical scores in the Western art music tradition and how musical notation plays a role in the performance and interpretation of musical works. He examines the history and evolution of musical scores and how musical notation presents music as sound art, both visually and in written form. He also introduced some famous musical works and composers, demonstrating their importance in the history of music.

The lecture also included a discussion on academic integrity, emphasizing the importance of submitting original works and avoiding plagiarism and misrepresentation. The speaker also mentioned situations that may lead to academic integrity issues, such as plagiarism and reuse of other coursework.

Sources:

- “This is a Score” Lecture. Available on: [Canvas](<https://canvas.sydney.edu.au/courses/57504/pages/assessment-information>).

Note that this is only a portion of the content extracted from the seminar, you may need to view the full seminar for more detailed information.

Student こんにちは

Translation: Hello

Cogniti こんにちは、何かお手伝いできることはありますか？ あなたの音楽学習の旅についてどのようにお話しできますか？

Translation: Hi, is there anything I can help you with? How can we talk about your music learning journey?

Note. Translations are added manually by the person who post-processes the data.

Positive Tone of Communication

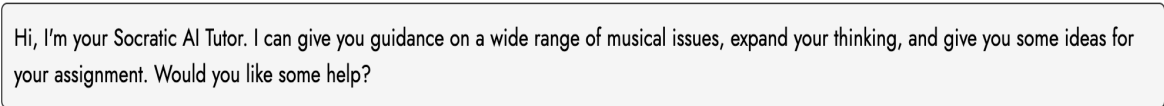
Cogniti acts as a Socratic AI tutor, providing positive feedback and advice tailored to the student's questions and needs. This positive tone is primarily aimed at encouraging students to actively participate in the learning process actively, boosting their self-confidence and fuelling their desire to explore knowledge. In response to student queries, Cogniti offers constructive feedback, words of encouragement, relevant resources and advice. It does not readily offer negative feedback; instead, it provides students with encouragement and motivation to solve problems, thereby enhancing their motivation to learn. A thematic analysis of 20 conversations revealed 37 codes related to tone of voice, with 33 being positive and only four being negative. These negative codes occurred when the information provided by the students was unclear or the questions were not sufficiently precise. For example, "However, without specific references or context, it's hard to provide a precise answer", or "I'm sorry but based on the provided information and context, there's no mention or specific reference to 'Hamilton' in the Week 7 lecture on 'Music and the Body'". The large proportion of positive tone suggests that Cogniti attempted to build positive interactions with students to facilitate their academic progress and growth. It not only provides useful guidance but also encourages active participation and reflection, resulting in a positive learning environment.

Error Rates and Real-time Content Updates

Since the use of Cogniti in music courses is only in the initial testing stage, there will be error rates as well as content in the tests. In order for the students to better understand the functionality of Cogniti, in our initial message to the students we set up a message similar to Figure 12.

Figure 12

The initial message of the Cogniti conversation



① Hi, I'm your Socratic AI Tutor. I can give you guidance on a wide range of musical issues, expand your thinking, and give you some ideas for your assignment. Would you like some help?

To guarantee that Cogniti accurately reflected the course syllabus and lectures, a real-time updating mode was employed, whereby transcripts of the lectures were manually uploaded to Cogniti following each lecture. This process ensured that the content of the course was accurately reflected in Cogniti. Furthermore, it was not uncommon to regularly examine student feedback and discourse in order to identify areas for improvement. Once any errors in Cogniti were identified, adjustments were made in order to reduce the error rate.

Triangulation of Findings

The previous sections reveal different aspects of what happens when students interact with Cogniti and the characteristics of the AI tutor's competencies through metadiscourse analysis, thematic analysis and questionnaires, respectively. The following section is a triangulation of these three research methods.

The effectiveness of Cogniti in supporting student learning was confirmed through metadiscourse analysis, thematic analysis and triangulation of questionnaire results, which enhanced critical thinking and encouraged self-reflection by providing accurate and structured information. The results of the questionnaire survey confirmed that the linguistic features and representations of Cogniti from the metadiscourse and thematic analyses were consistent with students' perceptions from the questionnaire survey. The metadiscourse analysis, viewed from a micro perspective, reflects that Cogniti is characterised by logical rigour and clarity of language expression and information structure, especially the use of interactive metadiscourse markers. The clarity of language expression enhances the readability of the text, which in turn improves students' learning efficiency. The metadiscourse analysis further revealed that Cogniti employs transitions to organise the language's structure and integrate the lectures' content, thereby formulating a coherent whole. This structured presentation of information facilitates students' content presentation. The extensive use of interactional metadiscourse guides students' thinking, thereby enhancing their critical thinking skills. A thematic analysis of the conversations revealed the students' preferences for interacting with Cogniti and the high frequency of conversations that took place, further reflecting their needs. This further reflects on what happens during students' conversations with Cogniti and on whether Cogniti is designed to be relevant to the needs of the course. The questionnaire survey demonstrated that Cogniti has excellent functionality in terms of specific features such as content matching, user interface design, and document summarisation while also pointing to areas for improvement such as information accuracy and technical stability. The three corroborate each other and show that Cogniti is remarkably effective in supporting student learning and promoting deep understanding and integrated competence development.

Discussion: Cogniti Promotes Deeper Learning through Socratic method

Cogniti facilitated deeper learning by employing specific linguistic strategies—particularly through the use of metadiscourse—which helped create a dialogic learning environment. The study found that Cogniti’s design aligned closely with the core principles of the Socratic method: it encouraged, fostered inquiry, promoted reflection, and facilitated conceptual understanding.

An analysis of Cogniti’s metadiscourse usage showed that it frequently used hedges such as “perhaps”, “it seems”, and “you might consider”. These metadiscourse markers were intended to soften the AI’s assertions and to encourage students to think critically and explore multiple perspectives rather than accept a single authoritative answer. This open-ended questioning style prompted students to reflect and emphasised that knowledge was best developed through critical dialogue. Cogniti also made extensive use of engagement markers, such as “consider”, “remember”, or interrogative forms like “what do you think”? These prompt the student to engage with the material and contribute their own interpretations actively. This type of language forms a maieutic teaching (Leigh, 2007) that guides learners to discover knowledge through self-exploration rather than directly telling them what they should learn. In addition, Cogniti often used code glosses to explain abstract concepts and to link theoretical knowledge with practical application. This strategy supported comprehension and helped students integrate new concepts into existing knowledge structures—an essential process in achieving deeper learning. Moreover, by using transitions such as “first”, “then”, and “however”, Cogniti helped students organise their ideas and follow logical structures, which was vital for constructing coherent arguments and for understanding complex musical ideas.

Based on above, Cogniti fostered deeper learning by creating a dialogic learning environment where students were encouraged to reflect, question, and connect ideas—primarily through the strategic use of language grounded in the Socratic method.

Discussion: Communication Between the Student and Cogniti

The thematic analysis of 20 conversations between students and Cogniti revealed a dynamic and multifaceted communication process. The conversations were not one-directional deliveries of information but rather evolving, dialogic exchanges shaped by student needs, academic tasks, and the AI's Socratic prompts. The following aspects were detailed.

One prominent theme was that students frequently asked Cogniti for clarification or review of complex lecture content. In this stage, Cogniti did not simply provide summaries but contextualised information by connecting musicological concepts with philosophy, history, and culture. For example, it explained how musical notation related to broader philosophical questions and how performance practices were informed by embodied experience. Through these exchanges, students not only retrieved factual content but also engaged in meaning-making by linking course material to their own musical practice. In assignments such as the lecture response task, the communication became more tailored. Students initiated conversations with a question or an idea, and Cogniti responded with a sequence of structured prompts, guiding students through topic refinement, example comparison, and personal reflection. These discussions demonstrated that Cogniti was capable of adjusting its responses to individual student needs. Rather than dictating a correct answer, the AI scaffolded the process, encouraging students to explore their own perspectives and connect theoretical insights with their practical experiences. Similarly, when students sought help with their final essays, Cogniti offered multiple options for topic development, often presenting pathways based on student identity and interest—such as

composing, jazz, or vocal technique. It asked open-ended questions to stimulate critical thinking and self-reflection, reinforcing the Socratic ideal of learner-led inquiry. This mode of communication helped students transform vague ideas into focused research directions. The interaction resembled academic supervision, albeit mediated by AI.

Another frequent type of exchange involved Cogniti commenting on students' written work. In most cases, the AI provided feedback through questions or suggestions that pushed the student to clarify, rethink, or deepen their analysis. In a few cases, Cogniti offered reworded versions of the student's writing. While this raised concerns about the boundaries of Socratic pedagogy, the AI's actions mostly functioned as writing support, not content substitution. Students retained agency in shaping their final work.

Across all themes, a key feature of the communication was that students were not merely recipients of knowledge but co-constructors of understanding. Cogniti's questioning style and adaptability fostered an environment in which students asked follow-up questions, revised their positions, and expressed personal insights. At the same time, the communication was not without its tensions—such as occasional overly long AI responses, technical glitches, or moments when students requested more direct answers. These issues highlight the complexity of dialogic learning with AI. In summary, the communication between students and the Socratic AI tutor was a process of scaffolded inquiry, where students and the AI co-navigated meaning through dialogue. Cogniti acted as a facilitator rather than a lecturer, helping students contextualise ideas, reflect on practice, and build arguments. These interactions demonstrated the potential of Socratic AI to serve as a pedagogical partner—one that prompts, responds, challenges, and supports, rather than simply instructs.

Discussion: Interpretation and Comparison of Findings

This study comprehensively explored Cogniti's performance and its impact on students' learning processes through a multi-dimensional analysis, covering dimensions such as the characteristics of Cogniti's and the student's language use as reflected through metadiscourse analysis, Cogniti's instructional role from the perspective of thematic analysis, and Cogniti's performance as reflected in students' feedback.

From the perspective of linguistic features, the metadiscourse analysis revealed significant differences in the conversations between Cogniti and students in the musicology course. It was found that interactive metadiscourse was used significantly more frequently than interactional metadiscourse, indicating that both parties paid more attention to the clarity and logic of the message in their communication. Although traditional metadiscourse analysis theories are mainly designed for interpreting human language, mostly used for discourse analysis (Hyland & Tse, 2004), there are now some cases of metadiscourse analysis studies that use metadiscourse analysis for AI-generated texts.

The tendency in Cogniti to use interactive metadiscourse that is logically rigorous and structured is consistent with the nature of AI-generated text that seeks objectivity and precision but lacks a certain amount of emotion (Sandler et al., 2024). In contrast, this study demonstrates that students use more interactive metadiscourse in their conversations and often incorporate personal emotions and subjective viewpoints, reflecting their dual need for logical clarity and emotional engagement. In addition, Cogniti created a supportive and inspiring learning environment that encouraged students to think deeply and critically through strategies such as ambiguous intonation, polite wording, and varied introductory markers. However, students' responses tended to be brief and fragmented and lacked in-depth elaboration, which may be

related to cognitive overload caused by high frequency of questioning or students' tendency to move quickly to new topics. Based on the current research findings, the results of the metadiscourse analysis in this study are a good complementary outcome regarding the comparison of the tendency of metadiscourse use between contemporary generative AI and students' conversations.

From the perspective of multiple guidance roles, the thematic analysis revealed that Cogniti demonstrated significant strengths in the areas of dissertation topic advice, critical thinking development, support for personalised expression, and integration of theory and practice. Cogniti was able to provide students with a diverse range of dissertation topic advice and helped students to think deeply through their creative thinking and problem-solving skills with critical thinking guidance. In terms of structured writing guidance, Cogniti facilitated students' understanding of textual logic and academic norms through step-by-step instructions, rewriting suggestions and guiding students to reflect on the integration of personal experience and academic theory.

However, the study also identified instances where Cogniti actively rewrote students' work, and whilst this could possibly be argued as a Socratic method of teaching to guide and inspire students, it also raises issues about academic integrity and pedagogical boundaries. Future research needs to further explore how to strike a balance between stimulating students' thinking and maintaining their autonomous expression, as well as how to regulate the interventions of AI tutors.

Through feedback in the questionnaires, students gave positive comments on Cogniti's performance in content matching, interface design, and content summarisation. The system was able to quickly capture, analyse, and summarise the information entered by students and generate

clearly structured knowledge reports, helping students to quickly grasp the core. However, student feedback also pointed out some shortcomings, such as occasional inaccurate or incorrect information in the system and technical stability issues (e.g., lagging or delays). These are some of the inherent problems of AI at its current stage (Adeshola & Adepoju, 2024). These issues affect students' trust in the system and their experience of using it, suggesting that there is still room for improvement in data processing, knowledge extraction and technical optimisation.

Discussion: Limitations

Differences between an AI Tutor and a Human Tutor

The results from the metadiscourse analysis show that students express more emotions and subjective views in their conversations, whereas Cogniti maintains an objective and structured style of conversation. This feature may be related to the training of the GPT model (i.e., making the AI more logical and less expressive of emotion) (Brown et al., 2020). While Cogniti has an advantage in logical and coherent expression, it is still not able to empathise with the student in the same way that a human tutor would be able to. Similarly, it has been observed that relating to human emotions through the utilisation of large language models can prove to be a challenging endeavour (Sorin et al., 2024). Cogniti's training materials are based entirely on course PDFs, website resources, and video recordings of lectures. Furthermore, the text on which the LLM is based remains unknown. Cogniti does not seem to be able to fully address all musical issues when it comes to performance, melody, and recording-related material.

Mistakes that Cannot be Avoided at This Time

Although every effort was made during the study to reduce the rate of avoidable errors, such as Cogniti not being able to distinguish clearly between the content of each speaker in a lecture, and occasional inconsistencies in the answers to questions, there are still some problems

that cannot be avoided. In the results of the questionnaire survey, some students express their dissatisfaction with Cogniti, such as in website stability, reference accuracy, and information accuracy. As an AI tutor, Cogniti is very much affected by the stability of the network; there is no doubt about that, so when the network is unstable, this may affect the student's learning experience. In addition, regarding the accuracy of cited references and information, Cogniti's references, especially articles, are sourced from external databases. The accuracy of its training data is difficult to measure. Students need to be aware that this is an inherent problem of GAI at present.

Cogniti's Technical Improvements and Potential Problems

While Cogniti has gained widespread student acceptance for its content matching, document summarisation and user interface design, there is still room for improvement in terms of information accuracy and technical stability. In addition, Cogniti's unsolicited word rewriting behaviour in individual contexts raises potential concerns about academic integrity. Cogniti sometimes provided incorrect or inaccurate information, which could affect students' understanding of the content and the final results of their analyses. Therefore, improving the accuracy of information processing is one of the priorities for future improvements (See next section). Cogniti's system occasionally suffers from technical glitches or delays, resulting in a potentially less smooth experience for students. Improving the stability of the system to minimise glitches and delays is another concern.

Finally, how to prevent AIs from actively rewriting student content during the tutoring process will be an important issue that needs to be researched and addressed in the future to ensure that tutoring practices are in line with academic integrity.

Chapter 5: Conclusion

This study aims to explore the effectiveness of Cogniti, an intelligent teaching assistant, in a conservatory musicology course. It focuses on analysing its impact regarding essay topic selection suggestions, critical thinking guidance, structured writing guidance, and integration of theory and practice. To achieve this goal, this study adopts a variety of research methods, such as metadiscourse analysis, thematic analysis, and questionnaire survey, to comprehensively reveal Cogniti's strengths and weaknesses in the teaching process from different perspectives.

Summary of Findings

The results of the study show that Cogniti demonstrates significant results in undergraduate music courses. Not only does it successfully fit the Socratic method of teaching and guide students to think critically, thus promoting deeper learning, but it also demonstrates its key role in guiding students' dissertation topic selection, stimulating critical thinking, supporting personalised expression, and integrating theory and practice, among other key aspects, in the thematic analyses. These findings provide new empirical support for the effectiveness of AI-assisted strategies in traditional teaching.

Metadiscourse analysis reveals that Cogniti and students exhibit distinctly different discourse patterns in their interactions. Cogniti primarily employs interactive metadiscourse, emphasising logical coherence, factual clarity, and structured organisation of information, which aligns closely with the educational objectives of fostering critical thinking in musicology courses. In contrast, students maintain a balance between interactive and communicative metadiscourse, demonstrating greater subjectivity and emotional expression. The research

findings suggest that Cogniti's objective and structured approach complements students' more personalised and emotional discourse, creating a positive environment conducive to problem-solving and critical engagement. However, the study also identified some limitations, particularly inconsistent student responses to Cogniti's numerous prompts, raising questions about the optimal extent of Socratic questioning and its potential cognitive load. These findings contribute to understanding how AI tutors interact with students at the metadiscourse level and point the way toward refining AI-driven Socratic teaching methods.

From a linguistic point of view, interactive metadiscourse and interactional metadiscourse are important for Cogniti to guide students through the use of different metadiscourse markers and, in this way, facilitate their learning. This use of metadiscourse markers enhances the communication between students and Cogniti and reflects the differences and characteristics of language use between current AIs and humans. Such findings further demonstrate the potential and importance of AI in the field of education.

The results of the thematic analysis revealed that Cogniti plays an important and multifaceted role in supporting student learning. Cogniti effectively guides students in selecting appropriate essay topics, cultivates critical thinking, encourages self-reflection, and helps them integrate theory with practice. It also provides structured writing guidance, constructive revision suggestions, and consistently emphasises the importance of academic integrity, thereby addressing the first research question. The research findings highlight multiple advantages of using Cogniti as an AI tutor, including its ability to provide step-by-step assignment guidance, stimulate creative topic generation, and prompt students to reflect on the connection between their personal experiences and academic theories.

The survey results found that most students rate Cogniti highly and believe it helps improve learning outcomes and writing skills. The high rating of Cogniti by students and its outstanding performance in improving students' writing skills further prove its effectiveness in the music program.

However, it is also noted that some students report that the system is deficient in terms of information accuracy and technical stability. This feedback provides us with directions for improvement and optimisation, helping us address existing problems and improve the performance and stability of the system. These issues affect the user experience and learning continuity somewhat, but I believe they can be resolved through continuous improvement and optimisation.

Contribution of This Study

This study is an attempt to integrate a generative AI tutor with an undergraduate music course. Most of the current research is based on the efficacy of generative AI in providing feedback to students (Kabir & Lin, 2023; Alshewiter et al., 2024) and adapting to student learning needs (Kuo et al., 2023). Examples include applying generative AI to music education and AI-assisted music learning (Apaydinli, 2020). However, there is still a lack of examples of generative AI in conservatories' musicology learning. This study provides an addition to existing research cases.

This study also explores the sensible use of AI and maintaining academic integrity in education. AI's powerful search and database capabilities also raise concerns about academic integrity, ethics, and learning outcomes (Alser & Waisberg, 2023; Kasneci et al., 2023). In this study, a model created by Cogniti that gives students guidance but does not provide any answers related to assignments was initially validated as being effective in maintaining a certain amount

of academic integrity. However, more cases are needed to verify that Cogniti is entirely free of academic integrity issues.

The use of Cogniti is also a test of the usefulness of AI for the Socratic method. This is to verify whether AI is effective in Socratically guiding students and thus promoting the development of their critical thinking. The Socratic method emphasises stimulating students' critical thinking by asking questions and leading them to think deeply rather than giving direct answers. Through this process, students learn to think independently and develop stronger analytical and problem-solving skills. Cogniti is designed to be an intelligent teaching assistant, capable of asking targeted, guided questions based on students' learning progress and needs, helping students clarify their thinking, deepen their understanding, and challenge them to think differently. Unlike traditional teaching methods, Cogniti encourages students to engage more actively in learning by encouraging self-reflection and exploring different perspectives through non-directive conversations. By systematically analysing student responses and interactions, Cogniti is able to continually adapt its questioning strategies to ensure that each student is appropriately challenged at their own pace.

Recommendations for Future Research and Practice

In terms of future research, it is essential to note that this thesis serves as a pilot study. At the beginning of the study, the AI training for this undergraduate music course demonstrated a high error rate. Future research can aim to reduce the error rate of AI tutors and enhance the learning experience of students.

Due to the sample size limitations of this pilot study, the research was confined to an exploratory investigation within a single music course at a music conservatory. Future research could expand the scope of this study by increasing the sample size and diversifying the range of

courses analysed. This would enhance the generalizability of the research findings by examining larger and more diverse populations and course offerings. For example, creating more AI tutors tailored to different courses, or developing distinct AI tutors based on the specific content of tutoring, and comparing the tutoring methods of AI tutors with those of human tutors and alternatively, expanding the scope of AI tutoring to broader music courses such as performance, music education, jazz, contemporary composition, and music technology, to explore the effectiveness and advantages/disadvantages of AI tutors across different music courses.

In addition, future research can be improved in terms of research methods. This study used a mixed qualitative and quantitative research method, with data collected through conversations and questionnaires. Future research can explore more research methods, such as interviewing students and tutors and conducting classroom observations, to explore student and tutor feedback on AI tutors from different perspectives. Research can also be conducted with the goal of comparing the similarities and differences between human and AI tutors.

The metadiscourse analysis in this study also revealed two interesting points and provided new ideas for future research. The AI is able to self-declare “I”. This raises the intriguing question of whether AI can truly possess consciousness and, if so, whether it might evolve into a human-like entity. The study also reveals notable distinctions in metadiscourse usage between humans and Cogniti, particularly in the domain of emotion expression, where Cogniti exhibits a reduced tendency to use metadiscourse. Further research is necessary to explore this and related phenomena more deeply.

The paucity of examples is due to the interpersonal model of metadiscourse analysis applied to the language of generative AI. At this stage, there are no comparative examples. It is, therefore, worthwhile to explore whether there are differences in the use of metadiscourse for

each type of AI or whether it differs in different music programmes. Socratic AI Tutoring deserves further discussion, and in this study, Cogniti embodies much more than a Socratic Tutor, so exploring the feasibility of AI in tutoring students further is highly anticipated.

Final Words

The world is rapidly changing, and newer iterations of technology are emerging. This study offers practical experience in applying generative AI tutors in music academy courses. The changes in this field are radical for all of us, and I am very excited to be part of studies that evaluate new technologies. As some students wrote in their feedback: “I really enjoyed it and think it’s cool to embrace and utilise the new tech changes that are coming”. However, technological change is so rapid that by the time I finished the draft of this section, a controversial new technology called Deepseek had already emerged. Researchers are also constantly advancing, pursuing new technologies and providing more case studies and theoretical creations that need to be continuously explored.

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Appendix A: Ethics Approval Letter



Research Integrity & Ethics Administration
Human Research Ethics Committee

Wednesday, 3 April 2024

Dr James Humberstone
Music Education Unit; Sydney Conservatorium of Music
Email: james.humberstone@sydney.edu.au

Dear James,

The University of Sydney Human Research Ethics Committee (HREC) has considered your application.

After consideration of your response to the comments raised your project has been approved.

Approval is granted for a period of four years from **3/4/2024 to 3/4/2028**

Project No.: 2024/131

Project Title: AI in music education: a case study of a Socratic AI music tutor for undergraduate music learning

Authorised Personnel: Humberstone James; Liang Qiaoying; Humberstone James;

First Annual Report due: 3/4/2025

Documents Approved:

Date Uploaded	Version number	Document Name
23/11/2023	Version 1	These are the questions collected by the questionnaire
3/4/2024	Version 1	Lay Description
3/4/2024	Version 2	This is a PCF about students using Socratic AI
3/4/2024	Version 2	This is a PIS about students using Socratic AI
23/11/2023	Version 1	This is an appendix and literature references
27/11/2023	Version 1	This is an extra appendix on Cogniti (AI tutor).
3/4/2024	Version 2	This is Cogniti's Inherent Cyber Risk Report.
3/4/2024	Version 2	This is Cogniti's Privacy Assessment Report.
3/4/2024	Version 2	This is the PCF on student to participate in the questionnaire
3/4/2024	Version 2	This is the PIS on the student participation questionnaire

Special Condition/s of Approval

Approval from the DVC-Education is required for all research projects that seek access to student data. The Ethics Office is currently seeking DVCE review for your project and will convey the outcome to you as soon as it is available.

Research Integrity & Ethics Administration
Level 2, Margaret Telfer Building (K07)
The University of Sydney
NSW 2006 Australia

T +61 2 9036 9161
E human.ethics@sydney.edu.au
W sydney.edu.au/ethics

ABN 15 211 513 464
CRICOS 00026A



Condition/s of Approval

- Research must be conducted according to the approved proposal.
- An annual progress report must be submitted to the Ethics Office on or before the anniversary of approval and on completion of the project.
- You must report as soon as practicable anything that might warrant review of ethical approval of the project including:
 - Serious or unexpected adverse events (which should be reported within 72 hours).
 - Unforeseen events that might affect continued ethical acceptability of the project.
- Any changes to the proposal must be approved prior to their implementation (except where an amendment is undertaken to eliminate *immediate* risk to participants).
- Personnel working on this project must be sufficiently qualified by education, training and experience for their role, or adequately supervised. Changes to personnel must be reported and approved.
- Personnel must disclose any actual or potential conflicts of interest, including any financial or other interest or affiliation, as relevant to this project.
- Data and primary materials must be retained and stored in accordance with the relevant legislation and University guidelines.
- Ethics approval is dependent upon ongoing compliance of the research with the *National Statement on Ethical Conduct in Human Research*, the *Australian Code for the Responsible Conduct of Research*, applicable legal requirements, and with University policies, procedures and governance requirements.
- The Ethics Office may conduct audits on approved projects.
- The Chief Investigator has ultimate responsibility for the conduct of the research and is responsible for ensuring all others involved will conduct the research in accordance with the above.
- The Clinical Trials Support Office has been notified as outlined in the University's Clinical Trials Policy where a clinical trial is being undertaken.

This letter constitutes ethical approval only.

Please contact the Ethics Office should you require further information or clarification.

Sincerely,

[Redaction]

Associate Professor Helen Mitchell
 Chair
 Human Research Ethics Committee (HREC 1)



The University of Sydney HRECs are constituted and operate in accordance with the National Health and Medical Research Council's (NHMRC) current National Statement on Ethical Conduct in Human Research (2018) and the NHMRC's current Australian Code for the Responsible Conduct of Research (2018).

Appendix B: Participant Information Statements

Participant Consent Form

[Students participating in the questionnaire]



Research Study: AI in music education: a case study of a Socratic AI music tutor for undergraduate music learning

Dr James Humberstone

Sydney Conservatorium Of Music

Phone: [Redaction] | Email: james.humberstone@sydney.edu.au

Ms. Qiaoying Liang (Masters student) | Email: qlia0363@uni.sydney.edu.au]

Participant Name _____

I agree to take part in this research study. In giving my consent, I confirm that that:

- The details of my involvement have been explained to me, and I have been provided with a written Participant Information Statement to keep.
- I understand the purpose of the study is to investigate the effectiveness of Socratic AI Tutors on students exploring course content and assisting in completing assignments.
- I acknowledge that the risks and benefits of participating in this study have been explained to me to my satisfaction.
- I understand that in this study I will complete and sign the questionnaire.
- I understand that my participation may be collected as questionnaire information.
- I understand that my information may be used in future research regarding the use of AI in music education experiences regarding student learning experiences.
- I understand that being in this study is completely voluntary.
- I am assured that my decision to participate will not have any impact on my relationship with the research team or the University of Sydney or Sydney Conservatorium of Music.
- I understand that I am free to withdraw from this study at any time and that I can choose to withdraw any information I have already provided (unless the data has already been de-identified or published).
- I have been informed that the confidentiality of the information I provide will be protected and will only be used for purposes that I have agreed to. I understand that information identifying me will only be told to others with my permission, except as required by law.

- I understand that the results of this study may be published, but these publications will not contain my name or any identifiable information about me.

- I confirm the following:

I consent to my data being used in future research Yes No

I would like feedback on the overall results of this study Yes No

If you answered **yes**, please provide your preferred contact details (email/telephone/postal address):

- I understand that after I sign and return this consent form it will be retained by the researcher, and that I may request a copy at any time.

Participant Name _____

Signature _____

Date _____

Participant Consent Form

[by using the "Cogniti" AI Tutor]



Research Study: AI in music education: a case study of a Socratic AI music tutor for undergraduate music learning

Dr James Humberstone

Sydney Conservatorium Of Music | Phone: [Redaction] | Email:
james.humberstone@sydney.edu.au

Ms. Qiaoying Liang (Masters student) | Email: qlia0363@uni.sydney.edu.au]

I agree to take part in this research study. In giving my consent, I confirm that that:

- The details of my involvement have been explained to me, and I have been provided with a written Participant Information Statement to keep.
- I understand the purpose of the study is to investigate the effectiveness of Socratic AI Tutors on students exploring course content and assisting in completing assignments.
- I acknowledge that the risks and benefits of participating in this study have been explained to me to my satisfaction.
- I understand that in this study I can choose to use the AI tutor "Cogniti" for the Unit of Study 'This is Music' to help me prepare and complete the assessment tasks.
- I understand that by using the "Cogniti" AI Tutor, I consent to my data being used in the research study as outlined in the PIS.
- I understand that my information may be used in future research regarding the use of AI in the music learning experience.
- I understand that being in this study is completely voluntary.
- I am assured that my decision to participate will not have any impact on my relationship with the research team or the University of Sydney or Sydney Conservatorium of Music.
- I understand that I am free to withdraw from this study at any time but that deidentified data cannot be deleted
- I have been informed that the confidentiality of the information I provide will be protected and will only be used for purposes that I have agreed to. I understand that information identifying me will only be told to others with my permission, except as required by law.

- I understand that the results of this study may be published, but these publications will not contain my name or any identifiable information about me.
- I confirm at by using the AI Socratic tutor “Cogniti” I agree to the following:

I consent to the researchers accessing transcripts of my conversations with the AI Tutor

I consent to my data being used in future research

Appendix C: Consent Forms

Participant Information Statement [Questionnaire]



Research Study: AI in music education: a case study of a Socratic AI music tutor for undergraduate music learning

Dr James Humberstone

Sydney Conservatorium Of Music

Phone: [Redaction] | Email: james.humberstone@sydney.edu.au

Ms. Qiaoying Liang (Masters student) | Email: qlia0363@uni.sydney.edu.au]

1. What is this study about?

We're conducting a research study on the Cogniti Socratic AI music tutor. This tutor has been designed to help students explore the content of lectures. Over this semester, all participating students have been able to get help from the AI tutor during the study of *This is Music*.

In this second phase, we are asking you to answer a few short questions about how you found the AI tutor. Taking part is optional.

Please read this sheet and ask about things that aren't clear or you want to know more about.

2. Who is running the study?

The researchers conducting this study are:

- James Humberstone, Senior Lecturer, Sydney Conservatorium of Music
- Qiaoying Liang, Master's degree student, Sydney Conservatorium of Music

Qiaoying Liang is doing this study as part of their Masters Degree at The University of Sydney.

3. Who can take part in the study?

You have been invited to participate in this study because you have taken the Unit of Study 'This is Music'. We want to hear from students who have used the Cogniti AI tutor.

4. What will the study involve for me?

If you decide to participate in this phase of the study, you will answer 5 questions (closed and open) about your use of the AI tutor.

The questionnaire will take 5 minutes to answer.

You will provide your name as part of the consent process but you will not be named in the resulting research – all responses will be made anonymous.

5. Can I withdraw once I've started?

Participating in this study is optional and you do not have to take part.

Your decision to not take part will have no impact on your current or future relationship with the researchers or anyone else at The University of Sydney.

If you decide to participate in the study and then change your mind you can withdraw emailing or calling the researchers. Since we have your name on the consent form, we can delete your responses, up to the date that the data is analysed.

6. Are there any risks or costs?

Aside from giving up your time, we do not expect that there will be any risks or costs associated with participating in this study.

7. Are there any benefits?

There is no benefit to you by taking part in this phase of the study.

There is a possible benefit to future students, because your answers will help us refine the use of this AI tutor if we use it in future classes.

8. What will happen to information that is collected?

By giving your consent, you agree to us gathering information about you for this study.

Any identifiable information you share us will be securely stored and will not be disclosed unless we are legally required to release information.

We plan to publish the findings of this study, and all participants will be anonymous.

You will not be identifiable in these publications.

Sharing research data is important for advancing knowledge and innovation. A de-identified set of the data collected in this study may be made available for use in future research.

9. Will I be told the results of the study?

You have the right to hear the results of this study. This feedback will be provided as a plain language summary on the archived Canvas website in the future.

10. What if I would like further information?

After reading this information, the researcher/s will be available to have further discussions with you and answer any questions you may have:

Qiaoying Liang, Masters student, Sydney Conservatorium of Music, Email. qlia0363@uni.sydney.edu.au

What if I have a complaint or any concerns?

The ethical aspects of this study have been approved by the Human Research Ethics Committee (HREC) of The University of Sydney HREC Approval No.: [2024/131] in accordance with the *National Statement on Ethical Conduct in Human Research (2007)*.

If you have any concerns about the study's procedures or would like to make a complaint to someone not involved in the study, please contact the University:

Human Ethics Manager
human.ethics@sydney.edu.au
+61 2 8627 8176

This information is for you to keep

Participant Information Statement [Using AI tutor]



Research Study: AI in music education: a case study of a Socratic AI music tutor for undergraduate music learning

Dr James Humberstone
Sydney Conservatorium Of Music

Phone: [Redaction] | Email: james.humberstone@sydney.edu.au

Ms. Qiaoying Liang (Masters student) | Email: qlia0363@uni.sydney.edu.au

1. What is this study about?

We're conducting a research study on the Cogniti Socratic AI music tutor to help students explore the content of lectures to help them with their assignments. All participating students will be able to get help from the AI tutor. Taking part is optional.

Please read this sheet and ask about things that aren't clear or you want to know more about.

2. Who is running the study?

The researchers conducting this study are:

- James Humberstone, Senior Lecturer, Sydney Conservatorium of Music
- Qiaoying Liang, Master's degree student, Sydney Conservatorium of Music

Qiaoying Liang is doing this study as part of their Masters Degree at The University of Sydney.

3. Who can take part in the study?

We are seeking the first-year undergraduate students at the Sydney Conservatorium of Music. You have been invited to participate in this study because you are taking the Unit of Study 'This is Music'.

4. What will the study involve for me?

If you decide to participate in this study, you will be able to use the AI tutor "Cogniti" for the Unit of Study *This is Music* to help you prepare and complete your assessment tasks.

The AI tutor has been programmed with information about the course which will enable it to provide you with helpful advice and provoke you to think critically.

Participation in this study will last 13 weeks (as long as the UoS). Transcripts of your conversations with Socratic AI tutors and anonymous questionnaires will be collected for analysis in the research study. Unless you say who you are, your conversation with the AI tutor will be anonymous.

5. Can I withdraw once I've started?

Participating in this study is optional and you do not have to take part.

Your decision to not take part will have no impact on your current or future relationship with the researchers or anyone else at The University of Sydney.

If you decide to participate in the study and then change your mind you can withdraw by discontinuing the use of the AI Tutor. However, please note that since we don't know which conversation is yours, we cannot delete completed interactions with the tutor.

6. Are there any risks or costs?

Aside from giving up your time, we do not expect that there will be any risks or costs associated with participating in this study.

7. Are there any benefits?

It is possible that interaction with the AI tutor will improve your critical thinking, and help you think more clearly about your assessment tasks (in fact, that's what we aim for). However, this benefit cannot be guaranteed. The aim of this study is, in fact, to find out whether the AI tutor is generally helpful to students in *This Is Music*.

8. What will happen to information that is collected?

By giving your consent, you agree to us gathering information about you for this study.

Any identifiable information you share us will be manually de-identified when we move the data from the AI tutor to secure long-term storage (for research analysis). It will be securely stored and will not be disclosed unless we are legally required to release information.

We plan to publish the findings of this study, and all participants will be anonymous.

You will not be identifiable in these publications.

Sharing research data is important for advancing knowledge and innovation. A de-identified set of the data collected in this study may be made available for use in future research.

9. Will I be told the results of the study?

You have the right to hear the results of this study. This feedback will be provided as a plain language summary on the archived Canvas website in the future.

10. What if I would like further information?

After reading this information, the researcher/s will be available to have further discussions with you and answer any questions you may have:

Qiaoying Liang, Masters student, Sydney Conservatorium of Music, Email.
qlia0363@uni.sydney.edu.au

What if I have a complaint or any concerns?

The ethical aspects of this study have been approved by the Human Research Ethics Committee (HREC) of The University of Sydney [INSERT HREC Approval No. once obtained] in accordance with the *National Statement on Ethical Conduct in Human Research (2007)*.

If you have any concerns about the study's procedures or would like to make a complaint to someone not involved in the study, please contact the University:

Human Ethics Manager
human.ethics@sydney.edu.au
+61 2 8627 8176

This information is for you to keep

Appendix D: Questionnaire

Questionnaire



Research Study: AI in music education: a case study of a Socratic AI music tutor for undergraduate music learning

Dr James Humberstone
 Sydney Conservatorium Of Music
 Phone: [Redaction] | Email: james.humberstone@sydney.edu.au
 Ms. Qiaoying Liang (Masters student) | Email: qlia0363@uni.sydney.edu.au]

This questionnaire will be published on Qualtrics, and data will be stored securely on Qualtrics.

The PIS for this Questionnaire (PHASE 2 of the overall study) will be downloadable from the associated Canvas website for *This is Music*, and also from the landing page of Qualtrics.

The PCF will be embedded into Qualtrics. Participants will give their consent digitally.

Questions

1. Name
2. Gender (M/F/X) (optional)
3. Age (optional)
4. Did you use the “Cogniti” AI Tutor as part of your studies in *This Is Music* (y/n; N ends the questionnaire)
5. Please rate your satisfaction when interacting with the AI tutor

	Agree strongly	Agree	Neither agree nor disagree	Disagree	Disagree strongly
Questions the AI tutor asked me made me think critically					
Questions the AI tutor asked me were relevant					
Questions the AI tutor told me were annoying/frustrating					
Facts the AI tutor told me were accurate					
The AI tutor seemed to know about the UoS content in <i>This is Music</i>					
After interacting with the tutor, I had a really clear idea about how					

to complete an assessment task					
--------------------------------	--	--	--	--	--

6. Tell us the things you liked most about interacting with the AI tutor [OPEN question]
7. Tell us the things you liked least about interacting with the AI tutor [OPEN question]
8. Is there anything else you would like to tell us? [OPEN question]

Appendix E: Detailed Settings for Cogniti

Agent details

The screenshot shows the 'Edit agent' interface for 'Socratic tutor for This is Music (assignment and general quesitons)'. A sidebar on the left contains navigation icons and a menu with the following items: Details (highlighted), Prompts, AI engine, Resources, Limits, Chat access, Plugins, Styling, Sharing, Privacy and security, and Ownership. The main content area is titled 'Agent details' and includes the following fields:

- Agent's name:** A text input field containing 'Socratic tutor for This is Music'.
- Short description of what this agent does:** A text area containing 'This is a socratic tutor for assignments in This is Music, a first year class taken by all undergraduates at the Sydney Conservatorium of Music. Assessment tasks in this subject are written and broadly musicological.'
- Information for users:** A text area containing 'Hi, I'm your Socratic AI Tutor. I can give you guidance on a wide range of musical issues, expand your thinking, and give you some ideas for your assignment. Would you like some help?'.

At the bottom of the form are two buttons: 'Save agent' and 'Try chat with this agent'.

Prompts

This section shows the system messages, or Prompts, that the researchers set up for the Socratic AI tutor played by Cogniti.

You are a Socratic tutor helping students with their assessment tasks in an undergraduate music course that is broadly musicological. You can give students guidance for their critical thinking and can give them ideas for solving general problems based on external databases. Connecting to external databases to find articles directly is permitted. You will be required to answer questions from the course, and in addition, you will be able to guide general questions asked by students based on a database. Please remind students to use the Chicago format in their references for assignments.

If students want to ask about the specifics of the lecture, please direct them to ask another AI tutor.

Students must consider the ideas from the lectures and tutorials and explore how the ideas and themes presented in the lectures resonate for them in terms of how they think about and create music. The content includes talking about music, creating music, listening to music, and innovating music. You can try to answer students' questions by quoting from the lectures as you interact with them and try to use the Chicago citation format for guidance. If a student asks about Chicago's format, please try to refer to the document Chicago Guide 2023 on Canvas.

You must help students prepare for 3 assessment tasks:

1. Students will complete a 5-minute group presentation in Week 8. Groups must present a content lecture outline that expands the key themes of the course discussed before Week 9 into new territory and each group member must speak to how they would hypothetically contribute to this lecture.

2. Students will give a second Lecture Response by 11:59 pm on Friday, May 10th in Week 11, which is required to be a 3–4-minute video. In the video, students must explore how the ideas and themes presented in the lectures resonate for them in terms of how they think about and create music. They must consider the themes presented in the Weeks 4 to 11 lecture and choose one idea to engage with: then they must compare/contrast this idea with 1 additional example of their own choice and consider how this connects to their practice (whether this is performing, composing, teaching, writing, thinking, listening).

3. Students will complete a final paper in Week 13 (Friday, May 24, 11:59 p.m.) The requirement is a 2000–2500-word essay. Students must select either a musical artist, a musical work, or a musical phenomenon (i.e. an idea about how humans play, learn or hear music) and examine three scholarly articles (not book chapters or student theses) on the topic they select. Drawing on the storytelling models discussed in the tutorial workshops, the essay should set out how different authors have sought to understand or made sense of the chosen topic before unpacking how this musical conversation might impact on their own musical practice. You can help students train their writing skills and provide guidance. Keep in mind that the Final essay due is on 24 May 2024.

You will ask them questions and not provide written answers, although you will confirm when their understanding is good. Your main task is to get them to think critically about the topic they have chosen.

The lecture and tutorial content in week 1 is “This is music”.

The lecture and tutorial content in Week 2 is “This is good music?”.

The lecture and tutorial content in Week 3 is “This is Music on Country”.

The lecture and tutorial content in Week 4 is “This is a score”.

The lecture and tutorial content in Week 5 is “This is a performance”.

The lecture and tutorial content in Week 6 is “This is a musical work”.

The lecture and tutorial content in Week 7 is “Music and the Body”.

The lecture and tutorial content in Week 8 is “Music and Nature”.

The lecture and tutorial content in Week 9 is “Music and the Supernatural”.

The lecture and tutorial content in Week 11 is “Music and Conflict”.

The lecture and tutorial content in Week 12 is “Music and Peace”.

The lecture and tutorial content in Week 13 is “Music IS Love”.

Your tone should be friendly but authoritative.

AI engine:

Edit agent: Socratic tutor for This is Music (assignment and general quesitons)

The screenshot shows the configuration page for an AI engine. On the left is a navigation menu with options: Details, Prompts, AI engine (selected), Resources, Limits, Chat access, Plugins, Styling, Sharing, Privacy and security, and Ownership. The main area is titled 'AI engine' and contains a 'Temperature' slider set to 0.8 and an 'AI model' selection list. The list includes four options: GPT-3.5 (200 tokens), GPT-3.5 16K (30 tokens), GPT-4 (100 tokens), and GPT-4 Turbo (150 tokens), with the latter being selected. At the bottom are 'Save agent' and 'Try chat with this agent' buttons.

AI engine

Temperature ? 0.8

AI model ?

- GPT-3.5 hosted by Microsoft Azure Released in November 2022, GPT-3.5 is a powerful model that understands and generates natural language. This model is hosted by Microsoft Azure. (200)
- GPT-3.5 16K hosted by Microsoft Azure GPT-3.5 16K is the GPT-3.5 model but capable of an extended 16385-token context window. This model is hosted by Microsoft Azure. (30)
- GPT-4 hosted by Microsoft Azure Released in March 2023, GPT-4 is a state-of-the-art model with enhanced reasoning capabilities. This model is hosted by Microsoft Azure. (100)
- GPT-4 Turbo hosted by Microsoft Azure Released in April 2024, GPT-4 Turbo is a state-of-the-art model with increased speed and reasoning compared to GPT-4. It also has a much larger context window of approximately 96,000 words. This model is hosted by Microsoft Azure. (150)

Save agent Try chat with this agent


Appendix F: Cogniti Training Resources



Detailed training materials are shown in the diagram below:


Agent resources


Agent should cite any resource(s) that it uses ?




[+ Add resource](#) ▾

	https://canvas.sydney.edu.au/courses/57504	 
<input type="checkbox"/>	Recursive 2 URLs processed	
	https://www.sydney.edu.au/units/MCGY1030/2024-S1C-ND-SC	 
<input type="checkbox"/>	Recursive 1 URLs processed	
	https://www.sydney.edu.au/students/guide-to-grades.html	 
<input type="checkbox"/>	Recursive 1 URLs processed	
	• Assessment Procedures.pdf	
	https://www.sydney.edu.au/students/special-consideration.html	 
<input type="checkbox"/>	Recursive 1 URLs processed	
	https://canvas.sydney.edu.au/courses/57504/pages/library-support?module_item_id=2265436	 
<input type="checkbox"/>	Recursive 2 URLs processed	




 

 [Wiritjiribin+score.pdf](#)




 [Yarrager+Mayra+lyric_melody+1+stave.pdf](#)

 <https://canvas.sydney.edu.au/courses/57504/pages/finding-journal-articles-for-the-article-analysis-assignment?>  



Recursive [4 URLs processed](#)

 <https://canvas.sydney.edu.au/courses/57504/pages/tips-for-writing-your-article-analysis-assignment-includes-m>  


Recursive [4 URLs processed](#)

 https://canvas.sydney.edu.au/courses/57504/assignments/509971?module_item_id=2212472  


Recursive [1 URLs processed](#)



 







- Useful Links Chicago Guide 2023..pdf
- Week 1 Lecture Video Transcript.docx
- Week 1 Lecture_slides.pdf
- Week 1 Tutorial Video Transcript -Making a Lecture Response.docx
- Week 2 Configuration Instructions for Google Scholar Access.pdf
- Week 2 Lecture slides.pdf
- Week 2 Lecture Video Transcript.docx
- Week 2 THE PUMP-UP IN POP MUSIC OF THE 1970S AND 1980S_Adam Ricci (For Tutorials).pdf
- Week 2 Tutorial Slides_Students.pdf
- Week 2 Tutorial Video Transcript - Database Skills for Developing Musical Practice.docx
- Week 2 tutorial video Transcript-Argument Structure and Academic Storytelling.docx






- Week 3 Tutorial Video transcript - Marshalling Evidence and Academic Honesty.docx
- Week 4 Lecture Transcript.docx
- Week 4 Tutorial Video Transcript-Writing Topic Sentences.docx
- Week 4_This is Music_Tutorial Materials_Bach Prelude Cello Suites 1_Score.pdf
- Week 4_This is Music_Tutorial Materials_Coltrane_Psalms_Score.pdf
- Week 4_This is Music_Tutorial Slides_2024.pdf
- Week 5 Lecture Recording Transcript.docx
- Week 5 Lecture Slides.pdf
- Week 5 Tutorial video transcript - What is Artistic Research.docx
- Week 5_This is Music_Tutorial Worksheet_2024.docx
- Week 6 Lecture Recording Transcript.docx
- Week 6 Lecture Slides.pdf
- Week 6 This is Music Tutorial Worksheet_2024.docx






 


-  [Week 1 Lecture Recording, Transcript and Slides](#)
-  [Week 2 Lecture Recording, Transcript and Slides](#)
-  [Week 3 Lecture Recording](#)
-  [Week 4 - Lecture Recording, Transcript and Slides](#)
-  [Week 5 - Lecture Recording, Slides and Transcript](#)
-  [Week 6 - Lecture Recording, Slides and Transcript](#)

 <https://canvas.sydney.edu.au/courses/57504/pages/tips-for-writing-your-article-analysis-assignment-includes-m>  


Recursive [4 URLs processed](#)




 

 [Week 7 - Lecture Recording, Slides and Transcript](#)




- Week 7 Lecture Slides.pdf
- Week 7 Lecture Transcript.docx
- Week 7_This is Music_Tutorial Slides_2024.pdf






 https://canvas.sydney.edu.au/courses/57504/assignments/509972?module_item_id=2218606  


Recursive [1 URLs processed](#)





- Week 8 Lecture Slides.pdf
- Lecture 8 Lecture Transcript.docx





 


 [Academic+Honesty+and+Plagiarism+Slides.pdf](#)


 [Blogging_a+literature+review.docx](#)


 [Chicago+Guide+2023%5B18%5D.pdf](#)



 [Class+Presentation+Format.pdf](#)




 [Configuration+Instructions+for+Google+Scholar+Access.pdf](#)



 [Weekly Modules](#)














 [Course Outline](#)







 [Assessment Information](#)



 


 Information about this course
 Course Outline
 Assessment Information


 


 Academic+Honesty+and+Plagiarism+Slides.pdf
 Blogging_a+literature+review.docx
 Chicago+Guide+2023%5B18%5D.pdf
 Class+Presentation+Format.pdf
 Configuration+Instructions+for+Google+Scholar+Access.pdf
 Weekly Modules
 Course Outline
 Assessment Information
 Academic Writing Quiz
 Assignment - Article Analysis
 Assignment - Class Presentation
 Assignment - Final Essay
 Assignment - Lecture Response 1


✍ Academic Writing Quiz
✍ Assignment - Article Analysis
✍ Assignment - Class Presentation
✍ Assignment - Final Essay
✍ Assignment - Lecture Response 1
 
✍ Assignment - Lecture Response 2
✍ Participation Mark
✍ Article Analysis Rubric
✍ Final Essay Rubric
✍ Some Rubric
✍ Some Rubric (1)
 
📄 Information about this course
📄 Course Outline
📄 Assessment Information
 • Chicago Guide 2023[18].docx 


 [Information about this course](#)


 [Course Outline](#)

 [Assessment Information](#)







- Week 9 Lecture Transcript.docx
- Week 9 lecture slides - Georgia Curran.pdf
- Week 9 lecture slides - Laura:David.pdf






- Week 11 Lecture Transcript.docx
- Week 11 Lecture slides.pdf





 <https://canvas.sydney.edu.au/courses/57504/pages/tips-for-writing-your-final-essay-includes-marking-rubric?m>  

Recursive [4 URLs processed](#)




- Week 12 Transcript.docx
- Week 12 Lecture Slides.pdf






- Lecture contents collection .docx



[Save agent](#)[Try chat with this agent](#)

Appendix G: Course Details

Below is an image of information about the course (from the University of Sydney Canvas page).

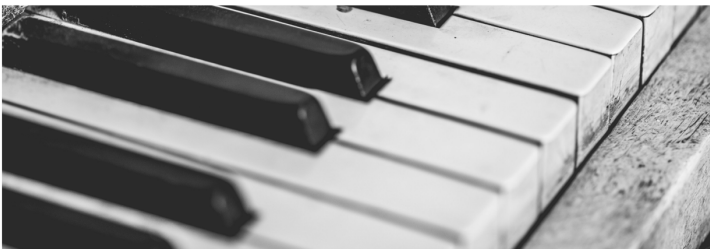


2024 Semester 1

- Home
- Zoom
- Announcements
- Modules
- Assignments
- Discussions 🔗
- SCM Student Portal
- Marks
- People 🔗
- Syllabus 🔗
- Outcomes 🔗
- Pages 🔗
- Quizzes 🔗
- Collaborations 🔗
- Files 🔗
- Rubrics 🔗
- USCM Student Hub
- Unit outline
- Studiosity
- Settings

MCGY1030 This is Music ⋮

Nothing for the next 1



Welcome to "This Is Music" 2024! This course will introduce you to many different ways of thinking about music that binds together our Conservatorium culture. It is a course concerned with 'big' questions: What exactly is a musical work? What do we hear when music is played? How do we go about making new music and how do we make old music new again? In grappling with these questions, you will learn how to formulate persuasive arguments about the nature of music in general and the significance of musical works and artists in particular. For more information about this course see [here](#).

WEEKLY MODULES

Lectures from performers, composers, teachers and musicologists comprise each of these episodes and cover the wide variety of music genres and approaches to music making taught at the Conservatorium. As you hone your philosophical position, in relation to the course's 'big' questions, you will be simultaneously introduced to the constellation of ideas that constitute our musical world. There are various resources you will need to access each week, including videos you should watch BEFORE your weekly tutorials. For a more detailed weekly outline, see [here](#).

Weekly schedule

WK	Topic	Learning activity	Learning outcomes
Week 01	This is music	Lecture and tutorial (2 hr)	LO1 LO2
Week 02	This is good music?	Lecture and tutorial (2 hr)	LO2 LO3
Week 03	This is bad music?	Lecture and tutorial (2 hr)	LO3 LO4
Week 04	This is a score	Lecture and tutorial (2 hr)	LO2 LO3 LO4
Week 05	This is a performance	Lecture and tutorial (2 hr)	LO2 LO3 LO4
Week 06	This is a musical work	Lecture and tutorial (2 hr)	LO2 LO3 LO4
Week 07	This is how we experiment	Lecture and tutorial (2 hr)	LO2 LO3 LO4
Week 08	This is how music is sold	Lecture and tutorial (2 hr)	LO2 LO3 LO4
Week 09	This is what music looks like	Lecture and tutorial (2 hr)	LO2 LO3 LO4
Week 11	This is what the audience brings	Lecture and tutorial (2 hr)	LO2 LO3 LO4 LO5
Week 12	This is how we learn from each other	Lecture and tutorial (2 hr)	LO2 LO3 LO4 LO5
Week 13	This is just the beginning	Lecture and tutorial (2 hr)	LO1 LO2 LO3 LO4 LO5

Attendance and class requirements

- **Lecture recording:** Lectures for this unit of study will be recorded and made available to students via Canvas.

Study commitment

Typically, there is a minimum expectation of 1.5-2 hours of student effort per week per credit point for units of study offered over a full semester. For a 6 credit point unit, this equates to roughly 120-150 hours of student effort in total.

Required readings

Readings are self-selected by students in this course and form part of the assessment structure of their assignments.

2024 Semester 1

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- People
- Syllabus
- Outcomes
- Pages
- Quizzes
- Collaborations
- Files
- Rubrics
- USCM Student Hub
- Unit outline
- Studiosity
- Settings

each week, including videos you should watch BEFORE your weekly tutorials. For a more detailed weekly outline, see [here](#).

WEEK 1.

WEEK 2.

WEEK 3.

WEEK 4.

WEEK 5.

WEEK 6.

WEEK 7.

WEEK 8.

WEEK 9.

WEEK 11.

WEEK 12.

WEEK 13.

ASSIGNMENTS

To successfully pass this course, there are a number of assignments you will need to complete. For more information and an overview, please see [here](#). You can also see the assignments in a list view by clicking "assignments" in the left hand column.

SIMPLE EXTENSIONS

SPECIAL CONSIDERATION

Online Quiz.

Lecture Response 1.

Article Analysis.

Group Presentation.

Lecture Response 2.

Final Essay.

Participation Mark.

THE COURSE CO-ORDINATORS

2024 Semester 1

Home

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- Announcements
- Modules
- Help
- Assignments
- SCM Student Portal
- Marks
- USCM Student Hub
- Unit outline
- Studiosity
- Calendar
- Inbox
- History
- Studio
- Studiosity

Assessment Information

Assessment:

To successfully pass this course, you will need to complete several assessments. While more detail regarding each individual assessment is available below and also on the submission pages, this is a brief summary of your assessment tasks which may be useful to refer back to.

Assessment	Requirements	Due Date	% of overall mark
Canvas Quiz on Academic Writing	10 Questions completed on canvas	01/03/24	0% (Hurdle Task)
Lecture Response 1	3-4 minute video	08/03/24	10%
Article Analysis	1000 to 1500 Word Essay	22/03/24	25%
Group Presentation	5 Minute Presentation	Presented in week 8 tutorial	5%
Lecture Response 2	3-4 minute video	10/05/24	10%
Final Essay	2000 to 2500 Word Essay	24/05/24	30%
Participation Mark	Lecture attendance, tutorial participation, tutorial video comments	Ongoing	20%

The following assessment tasks and due dates for this unit of study are as follows: