

INTED **2023**

17th International
Technology, Education and
Development Conference

6-8 March, 2023
Valencia (Spain)

CONFERENCE PROCEEDINGS



Sharing the Passion for Learning

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Sharing the Passion for Learning

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Preface

The INTED2023 Conference Proceedings contain selected and revised papers from the 17th International Conference of Technology, Education and Development. INTED2023 was held in Valencia, Spain from the 6th to the 8th of March 2023. INTED is an event that takes place annually and provides a platform for lecturers and researchers from more than 75 different countries to meet and share important research and information about education, pedagogical technologies, and development.

The scope of INTED covers the fields of Education and Educational research. INTED2023 provided different keynote speeches, parallel thematic sessions, networking activities, workshops and interactive sessions. Since many international educational experts attended the conference, participants were provided an opportunity to network and collaborate with other experts from around the world. The keynote speeches are available at IATED Talks (iated.org/talks/).

The INTED2023 Proceedings, which are exclusively in English, include the accepted contributions presented at the INTED Conference, which will be included in the IATED Digital Library (library.iated.org). The INTED2023 International Program Committee is composed of lecturers and researchers from many different countries. A blind peer review process was followed in order to guarantee the quality of the final publication, and during this process the following points were evaluated: information content, relevance to the educational field, general structure, clarity of contents, originality, and relation to the conference topics and disciplines.

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Finally, we wish to wholeheartedly thank all members and delegates who have contributed to these INTED2023 Proceedings. We also wish to express our gratitude to all participants and attendees for their engagement, dedication and passion for education.

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INTED2023 Keynote Speakers

Keynote Speakers

José Antonio Bowen – *Association of American Colleges and Universities, United States*

Michael Wesch – *Kansas State University, United States*

Tracey Tokuhama-Espinosa – *Harvard University Extension School, United States*

José Antonio Bowen – Association of American Colleges and Universities (USA)



*Keynote speech:
Blended and Included*

Blended learning provides us with more options and modalities for what we do and when we do it. This creates opportunities, but also challenges, to ensure that everyone is learning. All good teaching is inclusive teaching and blended environments have the potential to create both better and more inclusive learning. Realizing this potential, however, requires a deeper consideration of transparency, belonging, engagement and scaffolding: good blended learning can maximize all of these, but only if we design it intentionally. This presentation will provide both a framework for thinking about inclusive teaching in blended learning and specific suggestions for designing assignments, activities, and structures that will support the success of all of your students.

Biography:

José Antonio Bowen, Senior Fellow at Association of American Colleges and Universities (AAC&U), has won teaching awards at Stanford and Georgetown, was Dean at Miami and Southern Methodist University and President of Goucher College. Bowen has worked as a musician with Stan Getz, Dave Brubeck, and many others and his symphony was nominated for the Pulitzer Prize in Music (1985). Bowen holds four degrees from Stanford University and has written over 100 scholarly articles and books, including the Cambridge Companion to Conducting (2003), *Teaching Naked* (2012 and the winner of the Ness Award for Best Book on Higher Education), *Teaching Naked Techniques* with G. Edward Watson (2017) and *Teaching Change: How to Develop Independent Thinkers using Relationships, Resilience and Reflection* (Johns Hopkins University Press, 2021). Stanford honored him as a Distinguished Alumni Scholar (2010) and he was awarded the Ernest L. Boyer Award (for significant contributions to American higher education) in 2018. He is now a senior fellow for the American Association of Colleges and Universities.

Michael Wesch – Kansas State University (USA)**Keynote speech:**

Teaching is really hard right now, and it's a "Great Thing"

For many of us, these past two years have presented us with the most difficult challenges we have ever faced as teachers. The pandemic has forced us to adopt new and unfamiliar technologies, adapt to ever-changing student needs, chipped away at our physical and mental health, and exacerbated political and ideological divides that now find their way into virtually every subject matter. Teaching has always been hard. Properly understood for all that it is - the instilling of knowledge, curiosity, discernment, character, wisdom, and skill in the next generation - the art of teaching is what the poet Rilke would call "a Great Thing." It is impossible to get exactly right, unconscionable not to try. But as Rilke notes, "growth is in being profoundly conquered again and again by greater and greater things." In this talk, we will explore how this mindset of seeing teaching as the impossible task that it truly is can actually energize us, center us, humble us, and most importantly, help us feel connected to our students and fellow teachers as we confront this mysterious great thing together.

Biography:

Michael Wesch is Professor of Anthropology and University Distinguished Teaching Scholar at Kansas State University. He is the creator of the Teaching Without Walls video series which includes the top-ranked YouTube video for college online teaching. The New York Times listed him as one of 10 professors in the nation whose courses "mess with old models" and added that "they give students an experience that might change how they think, what they care about or even how they live their lives." His videos have been viewed over 25 million times, translated in over 20 languages, and are frequently featured at international film festivals and major academic conferences worldwide. Wesch has won several major awards for his work, including the US Professor of the Year Award from the Carnegie Foundation, the Wired Magazine Rave Award, and he was named an Emerging Explorer by National Geographic. He is also co-creator of anth101.com and author of *The Art of Being Human*, a free and open textbook alternative for Introduction to Cultural Anthropology.

Tracey Tokuhama-Espinosa – Harvard University Extension School (USA)

***Interactive Workshop:
Pedagogical Knowledge and the Changing Nature of the Teaching Profession - How Neuroscience is Changing Education***

Despite great advances, there are still a great number of myths around the brain and how it learns. Misconceptions, overgeneralizations and a lack of information can do harm in the classroom, slow student learning, and reduce the likelihood of successful learning in our schools. The main objective of this workshop is to dispel these myths and replace them with high quality, evidence-based practice.

Do people really have learning styles? Is it impossible for an adult to learn a foreign language as fast as a child? Are there critical periods when a child should learn specific skills in school? Are some subjects harder to learn than others? Are girls' and boys' brains suited for different types of learning? Can a person really multi-task? The teaching-learning dynamic is surrounded by many myths, which will be discussed in a lively interactive session.

Biography:

Tracey Tokuhama-Espinosa, Ph.D. is from Berkeley, California, is an alumna of the Harvard Graduate School of Education, and currently teaches a course at the Harvard University Extension School entitled The Neuroscience of Learning: An Introduction to Mind, Brain, Health, and Education Science. She is currently an educational researcher and serves as an Associate Editor of Nature Partner Journal Science of Learning and co-founder of Connections: The Learning Sciences Platform.

Tracey researches indicators to measure educational quality; learning in the digital age; transdisciplinary thinking; bilingualism and multilingualism; and the general improvement of teacher practices. Her most recent books are the Bringing the Neuroscience of Learning to Online Teaching: An Educator's Handbook (2021); Neuromyths: Debunking False Ideas About the Brain (2019); and The Five Pillars of the Mind: Redesigning Education to Fit the Brain (2019). She has authored articles for UNESCO and was a member of the Organisation for Economic Co-Operation and Development (OECD) expert panel to redefine teachers' new pedagogical knowledge in modern times.

Tracey's current focus is on understanding What Kids Want to Know About Their Own Brains, a book coming out with Columbia University's Teachers College Press next year. She is also writing a book called ThinkWrite: The Neuroscience of Writing, which explains why writing is the highest form of thinking. Finally, she is co-editing a new Handbook on Brain, Neuroscience and Education, which is a collection of work looking at the future of educational practice.

Tracey has lived and worked professionally in Tokyo, Geneva, Lima, and Boston, and is currently in New York and works with teachers, schools, governments, and NGOs in 40 different countries.

Conference Tracks & Sessions

The INTED2023 conference program is available online at <https://iated.org/inted2023>

ORAL SESSIONS MONDAY

MOOCs & Open Educational Resources
AI for Learning
Flipped Learning
Soft & 21st Century Skills
New Experiences in Health Sciences Education
Challenges in Curriculum Design
Emotions and Anxiety in Math Education
Early Childhood Education
Personalized Learning Environments
Chatbots & Robots in Education
Teacher Support during the Pandemic
Creativity & Critical Thinking
New Experiences in Engineering Education
Cultural Redesign of Curricula
From ESP to CLIL
Keeping Students Engaged during COVID-19
Challenge-Based Learning
Pedagogical Innovations
Challenges & Practices during COVID-19
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Teaching STEM
Social Entrepreneurship and Service Learning
Language Learning Experiences and Research
Digital Literacy
Gamification & Game-Based Learning
Collaborative & Team-Based Learning
Blended Learning
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Entrepreneurship Education
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Information & Media Literacy

POSTER SESSIONS MONDAY

Quality in Education and Distance Learning
Pedagogical Experiences in Teaching and Learning

ORAL SESSIONS TUESDAY

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Hybrid & Flexible Learning
Barriers to Learning
Student Support
New Technologies in STEM Education
Internships and Workplace Learning
Competences and Skills in Engineering Education
Gender and Equality in Education
Technology-Enhanced Learning
Active & Experiential Learning

Educational Leadership and Management
 Learning Analytics
 Coding & Computational Thinking
 Links between Education & Research
 A Lesson in 360 Video Production: Creating Authentic Immersive Education
 Inclusion of Learners with Disabilities
 LMS & VLEs
 Problem & Project-Based Learning
 Professional Development of Teachers
 Tutoring & Coaching
 Towards a New Educational Model of Sustainability (NEMOS)
 Workplace & Lifelong Learning
 Medical Education
 New Technologies in Special Education
 Virtual & Augmented Reality
 Internationalization in Education
 Pre-service Teacher Experiences
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 Education for Sustainability
 University-Industry Collaboration
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 Student Motivation

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 New Trends and Challenges in Education

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 Blended & Mobile Learning
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 Learning Analytics & Educational Data Mining
 Educational Programming & Robotics
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 Social Media in Education
 Videos for Learning
 Technology Enhanced Learning

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Rethinking Assessment in COVID-19 Times
Mentoring & Tutoring
Student Support & Motivation

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Problem & Project-Based Learning
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Engineering Education
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ANALYSIS OF THE STUDENTS' IMAGINARY ABOUT A MUSIC TECHNOLOGY FOLLOWING A TPACK-BASED EDUCATIONAL INTERVENTION

T. Thayer¹, J. Tejada²

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²*University of Valencia (SPAIN)*

Abstract

This qualitative exploratory study presents the results of an educational intervention experience focused on the integration of ICT in the field of music education. The work sought to reconstruct the technological imaginary, self-perceived by the students themselves after a teaching intervention applied through the phases of an action research (AR). The planned intervention design was applied through an educational model based on a constructivist approach, student-centered and collaborative work, to develop teaching materials, using the project-based learning (PBL) strategy. The entire design was developed through the Technological, Pedagogical and Disciplinary Knowledge Integration Framework (TPACK). The participants were students entering the first year of higher education in a music pedagogy program at a Chilean state university. The study was based on the content analysis of qualitative data collection instruments complemented by a characterization of the participants' entry profile collected in an initial diagnostic phase. The sample was composed of 64 students (19 females and 45 males; M=20.46 years). Their opinions expressed that their expectations were met and they declared to have achieved significant learning in order to be able to apply ICT in transfer processes in the school classroom. They also highlight the role played by the collaborative work that was part of the educational model applied. The practical implications of this work point to the need to integrate pedagogical, disciplinary and technological contents in the training of music teachers.

Keywords: Music education, TPACK, intervention design, initial teachers' training.

1 INTRODUCTION

A recent research [1] points out how relevant it is to identify the characteristics of the university student's profile, since these data can be configured as an input for the definition of strategies and the implementation of actions to improve their performance during their higher education studies. The relevance of this task has its origin in the fact that globally, as well as in the private Chilean educational system, enrolment has expanded enormously, generating a new social group with low income and lower levels of education. The relevance of this task has its origin in the fact that globally, as well as in the private Chilean educational system, enrolment has had an enormous expansion, generating a new social group with low income and less cultural capital, who are willing to assume a financial burden waiting for a return on their investment, due to the difficulty of accessing the most prestigious public universities [2]. This process is known as the "commodification of Chilean education", a product of the privatisation of the Chilean education system [3], which has resulted in a systematic deterioration in the quality of education over the last decades.

In this sense, it is relevant today to know the profile of students entering higher education, given the beliefs and expectations that the academic body has about the scarce capacities they demonstrate to cope with their studies [1]. It is relevant to consider that this condition is also directly related to the socio-economic level of the schools from which the students entering higher education come from [4], [5], [6]. Currently, 54% of the enrolment in primary and secondary schools is in private subsidised schools and 9% in private paid schools, compared to 36% in the public sector [7].

With this background, we have presented an overview of what is happening in the Chilean education system, and justify the urgency of strengthening initial teacher training (ITE), since this is the beginning of the teacher training cycle in basic and secondary education.

In Chile, efforts have been made to strengthen initial teacher training (ITT) by promoting the establishment of pedagogical and disciplinary standards aimed at training teachers who are didactically competent and have a thorough mastery of the discipline [8]. In this regard, it has been established that music education teachers in Chile have not been able to overcome the behaviourist stage of its

application, as opposed to pedagogical standards that include the integration of ICT competences as a requirement in the pedagogical training of future music education teachers [9]. In this sense, the contribution of this research goes in the direction of showing a case of educational intervention that aims to reduce the uncertainties and uncertainties regarding the gap in the perception that teachers have about the digital competences of students.

Thus, taking the case of the initial training of future music teachers, data are gathered from a process of ICT integration, based on an intervention design that uses the TPACK [10] framework for the integration of technological, pedagogical and disciplinary knowledge, to propose a teaching intervention design that sought to interrelate the disciplinary and pedagogical subjects of a subject of the didactic axis of the curriculum in a music pedagogy degree, whose focus is music technology. In this context, a 2020 publication [11] warns that "although digital culture is part of our lives in most social interactions, until now such practices have emerged more from the peripheries of university institutions than from decision-makers". It is imperative that students develop progressive levels of autonomy and learning by integrating digital technologies into their teaching practices, adapting to the continuous advances in digital technologies [12]. Against this background and the literature reviewed, it is noted that there is a wide framework of references defining various instruments for measuring digital competence. However, there are few practical examples of plans for improvement and integration of ICT in the training of future teachers.

This study analyses the technological imaginary of the participants through a process of action research (AR), not only on the basis of their perceptions and biographical data, but also after implementing an educational intervention design through a proposal or educational model for ICT integration. The model was based on three axes 1) technological literacy, 2) project-based learning (PBL) and collaborative work, and 3) the TPACK framework for the integration of technological, pedagogical and disciplinary content [10]. With this educational model, a teaching intervention plan was designed [13] with the aim of strengthening the technological training of students who begin their training in music pedagogy. In this way, the contribution of this study is to review the impact that the proposed educational model has on the imaginary of the students participating in the integration of ICT, through the resolution of real situations or problems, in accordance with the indicators to be evaluated in the specific field of research [14], [15].

For the purposes of this study and in order to determine the profile of the students' technological imaginary, the focus of the data of interest was to collect opinions and statements that reflect the mental structures and the interrelation of disciplinary and pedagogical knowledge with technological knowledge that the students managed to apply through a sequence of projects for the production of educational materials, developed during participation in a music and technology subject through a cyclical process of action research [16].

2 METHOD

The present study has a qualitative approach within the sociocritical paradigm, based on the content analysis of qualitative instruments elaborated for an educational intervention process, based on an action research (AR) design, carried out in a Chilean state university.

To complement the initial profile of the participating students, information from an initial questionnaire applied in the diagnostic phase of the AR was used. From it, demographic information of the participants, previous musical studies, educational center of origin (private, subsidized or public), and questions on self-perception of ICT use and integration were extracted.

The qualitative data collection instruments (self-evaluation reports) were applied after the educational intervention process, which consisted of completing a sequence of three collaborative projects in small groups of two to four students, consisting of the development of educational products for the music classroom in elementary school. The didactic resources were developed following an educational model that was designed from a teaching intervention proposal [13] based on the constructivist approach, the project-based learning strategy (PBL) and collaborative work, all under the framework of integration of technological, pedagogical and disciplinary knowledge (TPACK) [10].

For the content analysis of the instruments, the Atlas-ti software was used, with which an inductive methodology was applied in which units of analysis (AU) were segmented to determine codes and their respective frequencies about the problems, beliefs and self-perception that the educational intervention process had on the participants. This process resulted in 20 codes in the analysis of the self-evaluation reports (Table 1). The coding of the self-evaluations was grouped into 5 categories defined a priori: (1) "learning", (2) "academic aspects", (3) "negative aspects", (4) "positive aspects" and (5) "prospects in the classroom". A sixth emerging category defined as "context" was included in the semantic analysis

(Figure 1). This new category is a product of social contingencies: "toma Feminista 2018" [17], "Estallido social en Chile" [18] and Covid 19 pandemic. These events of social connotation implied making adjustments and academic rescheduling, strengthening the use of online platforms (Moodle platform), elaboration of audiovisual materials, didactic guides and adapting face-to-face training to virtual classes.

2.1 Participants

The participants in the educational intervention process belong to a sample universe of 150 students who entered Music Pedagogy studies in the 2018, 2019 and 2020 cohorts. The sample of students participating in the intervention process was 64 students (19 females and 45 males; M=20.46 years). The intervened subject was "Informática Musical para el Desarrollo Docente; Audio Digital y Multimedia (IMDD:ADM) which is taught in the second semester of the 2018 curriculum of the Bachelor's Degree in Education and Pedagogy in Music (hereafter only Pedagogy in Music) at the Universidad Metropolitana de Ciencias de la Educación in Santiago de Chile. The objectives and the design of the subject programme were planned according to the intervention design elaborated for the action research initiated in 2018 [13].

To complement the characterisation of the profile of the student entering higher studies in music pedagogy, some demographic data, previous musical studies, questions about self-perception of their technological skills, school of origin (private, subsidised or public), etc. were considered. The data were extracted from an initial diagnostic questionnaire, given to the students in the first semester of their school terms.

2.2 Data collection instruments

Most of the instruments used in this action research process originated from a similar teaching intervention carried out in a Spanish university. [19], [20]. The self-assessment reports were collected during the AR evaluation process. The participants were the students of the 2018, 2019 and 2020 cohorts of the Pedagogy in Music degree. In order to prepare the self-assessment reports, participants were provided with a guideline of guiding questions.

3 ANALYSIS OF RESULTS

Based on the data collected, we proceeded to interpret and reconstruct the imaginary of students entering higher studies in music pedagogy, in order to explore the self-perception of their ICT competences regarding technology and its integration in the pedagogical and disciplinary processes after the educational intervention. To this end, the content analysis of the data collection instruments described in section 2.2 was carried out.

3.1 Demographic data of participants

The diagnostic data showed that 32.1 % of students come from public schools and 52.6 % come from subsidised schools. The remaining 14.7% come from public schools. In general, the students have a mediocre evaluation of their musical education at school. On a 5-point scale, the students rate their musical education with 2.8 points, a little lower than "neither good, nor bad" or "fair". The quality of the musical education received in secondary school is rated with an average of 3.2 points. With regard to their previous musical studies, 49.4 % of the students entering the Music Pedagogy course indicated that they had had private instrument lessons and 66.7 % indicated that they had participated in a musical group as an amateur. More than 90 % have a user account on social networks such as Whatsapp, Instagram, Facebook and Youtube. Finally, the self-assessment of their ICT skills was given a score of 4 out of a maximum of 5, which means that most of them consider themselves to be "good" at using technology.

3.2 Self-reporting results

In each of the cohorts and as part of the AR teaching planning, a sequence of collaborative projects was carried out in groups of 2 to 4 students. As part of the educational model, in each of the projects, the different subjects of the subject being assessed (IMDD:ADM), whose evaluation criteria interrelated the pedagogical, technological and disciplinary contents using the TPACK knowledge integration framework [10]. A voluntary self-assessment process was included in the assessment instruments. The result was that 44 students, from the sample group of the teaching intervention, submitted self-assessment reports, guided by a guideline of suggested topics to be addressed. Among other topics that were proposed were to indicate their ideas about the subject: usefulness, suitability for first-year university level or other ideas

that they wanted to answer, such as: what do you think you have learned and what not? It was also suggested to address other topics on the perceptions they had in relation to the projects, collaborative work, infrastructure, autonomous work and finally on expectations fulfilled or not fulfilled in the subject.

As a first result of the content analysis of the self-assessments, 20 unit of analysis (AU) codes were determined, which were grouped into the different categories defined a priori. The set of codes is presented in Table 1 from highest to lowest frequency according to the result of the analysis. Table 2 presents the general categories or families of analysis codes, the number of codes in each category and frequencies of the analytical units (AU).

Table 1. Analysis codes and frequencies of analytical units (AU) reported by students in their self-assessment processes.

No.	Analysis codes and frequencies of analytical units (AU)		
1	Realized learning (74)	11	Subject level (13)
2	Transferability to the classroom (55)	12	Moodle evaluation (13)
3	Positive evaluations (43)	13	Self-assessment (11)
4	Collaborative work (42)	14	Pedagogical approach (11)
5	Online classes adaptation (31)	15	Negative collaborative work (10)
6	Negative evaluations (28)	16	Transversal module link(8)
7	Expectations (26)	17	Organization (6)
8	Facilities (23)	18	Assessment (3)
9	Pandemic (17)	19	Autonomous work (2)
10	Tutoring (15)	20	Social Context (2)

Table 2. Categories, number of codes in each category and frequencies of AU

No.	Categories	Codes	Total of analytical units (AU)
I	General positive aspects	4	156
II	Subject academic aspects	11	147
III	Learning	1	74
IV	Transferability prospective	1	56
V	General negative aspects	3	55
VI	Context	3	36

When analysing Table 2, the high number of codes associated with the category "general positive aspects" is striking, which is composed of 4 codes, totalling 156 AU. The next category with the highest number of AUs is "academic aspects" (AU 147), which is composed of 11 codes. The code "academic aspects" shares the analysis code "collaborative work" (42 AU), together with the category "general positive aspects". In synthesis, we can point out that these two categories globally gather and share the majority of the AUs of the study, showing a high valuation that the students had of the intervention carried out.

In order to illustrate the category "general positive aspects", some examples of analytical units declared by the students are extracted:

"...in this course, I learned and applied everything we went through in class, I was encouraged to learn more and it was a virtuous circle to understand this model of pedagogical technology and music". Student 2, 1:55

On the other hand, the categories of "learning and prospective transferability" are undoubtedly highly relevant as they correspond to unique analysis codes, with the highest frequency of AU. In this case "realised learning" has 74 (AU), followed by the code "transferability to the classroom" with 55 (AU). To illustrate these analytical units we quote a student who refers to both codes:

"I have been able to realise the countless things that can be done with technology, from programmes for creating scores to recording music in audio programmes, something that

will undoubtedly help me in the future as a teacher, as I understand how to use them in terms of a class, understanding that both didactics, theoretical knowledge and technological knowledge are the key to creating a good class". Student 1, 1:18

The following quote is important to highlight as it corresponds to a minority group of students who stated that they did not have digital competences at the beginning of their music education process in higher education:

"The subject has been very useful for me, both for work and for personal projects, I think that what the teacher taught was in accordance with our level at the beginning of higher education, when I entered the course my knowledge was almost nil regarding applications for voice editing, instruments and also score editing." Student 3, 1:38

The analysis code "prospective transferability" also had a high frequency in the self-reports (AU 56). In this quote, the student mentions how the technological approach is broken by the applied methodology, while at the same time recognising how technology is put at the service of learning and the pedagogical possibilities that computer tools can provide in his future teaching role:

"I was quite surprised by the teacher's approach to the subject, in terms of addressing technological knowledge as tools that we can use in the future to accompany the students' learning". Student 5, 4:27

Also noteworthy is the emerging category "context" which contained among its members the analysis code "online adaptation". This student highlights the importance of the use of communication platforms and instances due to the permanent social contingencies that were experienced throughout the teaching intervention process in each of the cohorts that participated in the AR. Thus, this student highlights the use of technology to face the contingencies and problems of the social context:

"In general, focusing on this subject area, I can say that the transition was much less costly and in general the communication platforms and instances allowed for progress in the content. The fact that it is a subject that focuses on technology and communications obviously had an influence, and it was not as problematic as in other subjects". Student 7 4:145

This other student mentions two codes from this emerging category by linking learning, online adaptation and pandemic:

"It is tragicomic, it seems that we had to learn the hard way the importance of including ICTs in our work and turn them into tools that are useful to overcome these times of isolation without having to compromise academic activities". Student 8, 4:253

To conclude this section of the exploratory analysis of the self-assessment reports, some relevant quotations of negative evaluations of the educational experience are included. For this purpose, two codes were identified as grouping negative AU: a) "negative evaluations" (AU 28) and b) negative collaborative work (AU 10). In total, both represent only 8.8% of the 433 AUs collected. Most of the AUs of the "negative evaluations" referred to the lack of time to deepen the technological aspects of software handling, knowledge of music and recording hardware, general technical aspects, presence, difficulty of collaborative online learning and difficulty of the subject. One particular criticism that stood out in this analysis and which is related to the teaching support materials available on the Moodle platform was the following:

"About the complementary material of the course, some helped me to understand more about the applications, but in general I didn't see it much, I preferred to ask by mail if it was OK what I was doing in terms of pedagogical and in terms of technology, I preferred to watch videos on YouTube that clarified me much more the subject or the topics I wanted to see or do." Students 4 1:60

To synthesise the content analysis of the self-assessment reports, a semantic network was constructed (Fig. 1) linking the different categories to the number of analytical units (AU). The red lines link the categories to the individual AU and the blue lines link the common UAs. The frequency of the AU of each code is also indicated in brackets.

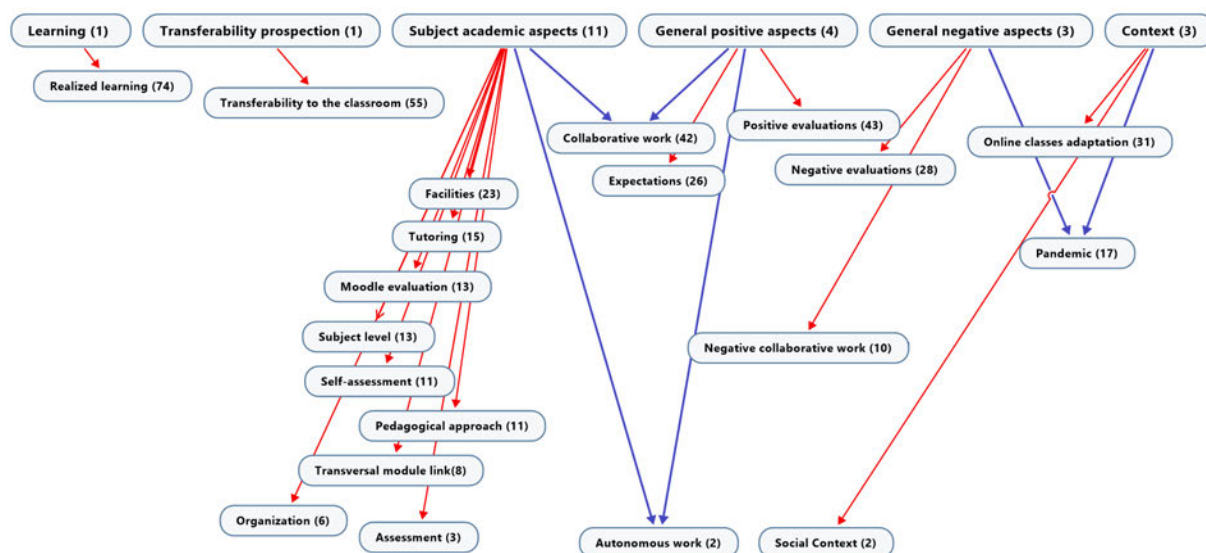


Figure 1. Semantic network of categories defined a priori, linked to the 20 analysis codes extracted from the self-assessments. Category "context" was a category of emerging codes.

4 CONCLUSIONS

The high frequencies of the analytical units (AU), grouped in the categories "general positive aspects" and "learning" clearly reflect that the teacher planning generated a positive impact on the participating students. In other words, the strategy of integrating pedagogical and disciplinary knowledge with technological knowledge was a relevant aspect of this teaching intervention, as the opinions of the participants went beyond just identifying perceptions of technology and evaluating the knowledge acquired in the subject. In this way, the analytical units collected show that the students experienced the didactic application of ICT resources by solving real situations or problems in accordance with the indicators to be evaluated [14], [15]. In other words, through the projects and teaching intervention, the students managed to develop educational materials with technological resources, to be used in pedagogical situations in the music classroom.

In this sense, the 55 AU of the "transferability to the classroom" code point out the importance and advantages of applying technology in processes of production of pedagogical resources in the classroom. Basically, this unit of analysis shows the impact that the TPACK [10] framework of integration of technological, pedagogical and disciplinary knowledge can have on the processes of ICT integration in initial teacher education (ITE). Another code that shows the positive impact of the educational model in relation to the project-based learning (PBL) strategy is collaborative work. The students recognise the importance that the advantage of working in groups has had on them, which in several cases allowed them to resolve the technological knowledge gap by sharing the expertise that each of them had mastered. This is one of the characteristics of constructivist theory, present in the educational model applied, which, supported by the PBL strategy and collaborative work, can generate zones of proximal development [21] within the work groups.

Another conclusion that can be drawn from the results of this analysis is that, as pointed out [1], it is relevant to identify the characteristics of the university student profile so that these data can be used as an input for the preparation of strategies and the implementation of actions to improve learning processes in higher education. We can also conclude that the development of educational action plans through projects that involve the resolution of real situations or problems, in accordance with the indicators to be evaluated in specific subjects. [14], [15] proved to be a strategy valued by the students as it means integrating pedagogical and disciplinary knowledge that can then be applied in the classroom.

Finally, another relevant aspect of the content analysis of the technological imaginary that students state after the teaching intervention process is related to the previous point (carrying out real projects) and to the unit of analysis "transferability to the classroom". These two factors show how the technological, pedagogical and disciplinary knowledge integration approach (TPACK) is a framework in which they identify these three types of knowledge articulated through the development of teaching materials produced from technological tools. At the same time, in the process of producing these teaching

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