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Context–based learning–a case study in the Central Highlands, Vietnam

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ABSTRACT

The Central Highlands (Vietnam) harbors a diverse array of traditional musical instruments belonging to 13 ethnic minority groups. However, this invaluable cultural heritage faces the imminent threat of being forgotten and lost due to the lack of generational transmission among the youth. Consequently, the preservation and development of these instruments have become a critical priority for the education sector. This study implemented context-based learning (CBL) approach in teaching the topic of sound-natural science in 7th-grade, to encourage students to engage in addressing issues related to the preservation of traditional musical instruments within their local communities. Through observations and in-depth interviews with nine "E De" ethnic minority students, the study found that students exhibited a strong interest in learning to craft and play traditional instruments. They recognized the importance of this learning in contributing to cultural preservation and demonstrated the ability to apply scientific knowledge effectively in the crafting and utilizing of these instruments. These findings underscore the potential of CBL as a powerful educational model for teaching cultural heritage in other countries. This approach not only deepens students' understanding of cultural values and social responsibility but also fosters mutual understanding and respect among different cultures on a global scale.

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1. INTRODUCTION

The Central Highlands of Vietnam hold considerable strategic importance to the nation, both economically and politically. The region's population is divided into two primary groups: indigenous ethnic minorities and settlers who arrived during various historical periods. The indigenous population comprises 13 distinct ethnic groups, representing approximately 25% of the total population of the Central Highlands [1]. These indigenous cultures originate from pre-state societies, where music plays a central role in all life events, from birth to death. Notably, they are the custodians of the "Space of Gong Culture in the Central Highlands," recognized as an intangible cultural heritage by United Nations Educational, Scientific and Cultural Organization or UNESCO in 2005. A unique characteristic of their musical heritage is traditional instruments crafted from locally available materials such as bamboo, rattan, and calabash [2].

However, modern society changes present significant challenges to preserving these cultural values. Both tangible and intangible cultural elements, including traditional musical instruments made from bamboo,

rattan, calabash, and buffalo horn, are at risk of extinction due to insufficient conditions and environments for their long-term survival. In the Central Highlands, the older generation of artisans who craft and play these as one of the minority ethnic groups among the 54 recognized ethnic groups in Vietnam, they traditionally inhabit the Central Vietnam region and northeastern Cambodia instruments are rapidly dwindling, while the younger generation shows limited interest in the cultural significance and technical aspects of these instruments [3]. This situation jeopardizes the continuity and transmission of cultural heritage. To address this issue, it is essential to foster a young generation that is committed to learning and preserving these cultural traditions. Sustainable education aims to nurture a responsible and culturally aware youth population [4]. Therefore, educational programs should integrate learning experiences that are closely tied to the cultural and social contexts in which students live.

Extensive research in education has demonstrated the positive impact of context-based learning (CBL) on student outcomes. CBL encourages active student participation by embedding learning within real-world contexts [5]. When learning tasks are related to real-life situations, scientific knowledge becomes more accessible and understandable to students [6]. Additionally, CBL has been shown to enhance problem-solving, critical thinking, and decision-making skills among students [7]. According to Maslow, CBL also positively influences students' self-esteem and social needs by creating a more flexible and less formal learning environment [8]. Furthermore, by linking learning content to real-world issues, CBL helps students develop a deeper awareness of social problems [9], [10]. Research supports the notion that knowledge is best constructed within the sociocultural context of the learner's environment, through active engagement and interaction with that context [11], [12] .When students become aware of societal problems, they apply scientific knowledge to propose solutions, improving academic performance and fostering a sense of social responsibility [13]. This demonstrates that CBL can be effectively used to organize learning activities that promote student engagement in the preservation and development of traditional cultural practices [14]–[16].

CBL has been widely studied in the field of social constructivist education, emphasizing the role of learners as active constructors of knowledge and highlighting the importance of the learning environment and context [17], [18]. According to social constructivist theory, CBL is a pedagogical approach where students construct knowledge through problem-solving activities grounded in cultural and social contexts. Learning and context are interdependent, forming the basis for effective educational experiences, as shown in Figure 1 [13], [19], [20]. CBL requires educators to link academic content to real-world situations, prompting students to relate scientific knowledge to their personal experiences and engage in complex learning tasks [21], [22]. This study is based on the social constructivist theory of CBL outlined above to implement learning activities.

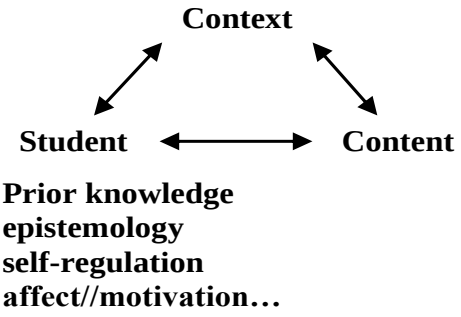

Figure 1. Contextual constructivist learning model [23]

As illustrated in Figure 1, three key factors must be carefully considered to apply CBL effectively: The first is learning context. The context should be selected to facilitate connections with students' personal experiences, boost motivation, and directly relate to the learning content to enhance students' understanding of scientific concepts [24], [25]. Secondly is learning content. The lessons should be designed around the context, allowing students to acquire knowledge through the process of solving real-world problems within that specific context [26], [27]. The third is learners. An interactive learning environment should be created, fostering collaboration among students, teachers, and the broader community. This involves encouraging students to ask questions, analyze real-world situations, devise solutions, and receive continuous feedback from both educators and community members [28], [29].

However, for CBL to be effective, it is crucial to select contexts that are appropriate for both the students and the learning content. The context should be familiar to students, widely recognized, and not distract from the core learning objectives [30]. Each student has a unique learning style, and the ability to

select the context helps them find the most suitable and effective approach to learning, which aligns with their individual preferences. This choice also boosts students' self-confidence and self-esteem as they feel valued. Teachers should be mindful of student differences when selecting a context, considering each student's unique abilities, interests, and learning approaches. Understanding these characteristics helps create a positive learning environment that supports and encourages creativity and personal development [29]. In this way, teachers not only impart knowledge but also aid in the holistic development of students, maximizing their potential in the learning process. Additionally, factors such as class size, school resources, social environment, and technological effects are important considerations in the context selection process [31]. Students need time to become accustomed to and proficiently interact with the chosen contexts [32].

We conducted a case study on the topic of "Sound" within the 7th-grade natural science curriculum to exemplify the application of the CBL approach. By investigating scientific concepts such as sound frequency, pitch, loudness, and their interrelationships, students were able to apply this knowledge to understand and explain the principles of traditional musical instruments used by indigenous groups in the Central Highlands. Teachers utilized CBL to structure learning activities that sparked students' interest in and appreciation for traditional instruments. This approach not only helped students learn how to use and craft these instruments but also enabled them to share their findings with the community, thereby contributing to cultural preservation. The CBL framework was implemented in a field-based learning program aimed at preserving the traditional musical instruments of the indigenous peoples in the Central Highlands. The program sought to teach students how to craft and use these instruments, while also equipping them with scientific knowledge and raising awareness of cultural preservation. The research questions addressed in this study were:

i) Does integrating the preservation of traditional musical instruments into teaching increase students' interest in learning to use and craft these instruments?
ii) Do students, through learning to use and craft traditional musical instruments, recognize that their actions contribute to the preservation of these cultural forms?
iii) Do students understand the scientific concepts related to the topic of Sound in the 7th-grade Natural Science curriculum, and can they apply these concepts in learning to use and craft traditional musical instruments from the indigenous peoples of the Central Highlands?

2. METHOD

A case study was conducted through the implementation of a field program in a village located in Dak Lak Province, with the program stages aligned with the phases of CBL. The village is inhabited by over 350 households belonging to the "E De" ethnic group. Students from this village are enrolled at EaBhok Secondary School. The program was carried out from June 2023 to October 2023, with the various stages detailed in Table 1.

Given the difficulties students faced in expressing themselves through written language, and considering the natural, honest, and unpretentious self-expression typical of Indigenous students from the Central Highlands, the research team employed semi-structured interview methods, direct observation, and indirect observation via video recordings to gather data. The data collected from the recorded interviews is considered reliable due to the inherent truthfulness of the Indigenous students. In line with the sequence of stages presented in Table 1, each student was interviewed three times. The timing of the interviews corresponded to the stages of the research program as: i) first interview (IW1): conducted after phase 1 and before implementing phase 2 of the program; ii) second interview (IW2): conducted immediately after phase 3; and iii) third interview (IW3): conducted after phase 4 when the program concluded.

Table 1. Phase of case study research program

Phase	Timeframe	Activities
Phase 1	Call for student participation in the program	Researchers contacted schools, and political and social organizations in the village to coordinate the implementation of organizing the class.
Phase 2	Exploring the cultural characteristics and conservation status of traditional Indigenous musical instruments of the Central Highlands	Students research books and newspapers and conduct surveys with people around them to learn about the characteristics and current status of the preservation of traditional musical instruments of indigenous people in the Central Highlands
Phase 3	Learning to craft and use traditional Indigenous musical instruments of the Central Highlands	Students learn how to use and craft musical instruments through the guidance of artisans
Phase 4	Exploring scientific concepts through the creation and use of traditional musical instruments	Students learn scientific knowledge about the "sound" topic in the 7^{th}-grade natural science subject through the process of crafting and using musical instruments

2.1. Participants

A total of over 30 students, aged 12-13 and who had recently completed the 6th-grade curriculum at their secondary school, participated in the study. All participants are members of the "E De" ethnic group, residing in the same village and attending the same school. Participation was voluntary for all students. Following the sampling strategy outlined by Walby [33] for qualitative research, participants were selected based on their representation of specific social and cultural contexts. Consequently, nine students were selected from the initial pool of 30 for in-depth interviews. This selection method ensured consistency in cultural and social contexts, given that all participants are from the same ethnic group and community. Such homogeneity enhances the representativeness of the sample due to the shared cultural and social backgrounds. Furthermore, the voluntary nature of their participation reflects a high degree of interest and commitment to the program, which contributes to obtaining more authentic and comprehensive feedback on the research topics. By focusing on a smaller, yet sufficiently diverse group of nine students from the original cohort, the study effectively captures both common and unique characteristics of the "E De" ethnic community. Therefore, the data derived from these in-depth interviews provide a reliable representation of the perspectives and experiences of this student group. Table 2 presents the details about the nine students.

Table 2. Information of nine students participating in the study

No.	Student	Gender		Age	Special case
		Male	Female		
1	ST1		x	12	-----
2	ST2		x	12	-----
3	ST3		x	13	-----
4	ST4		x	12	-----
5	ST5	x		12	Visually impaired
6	ST6	x		12	-----
7	ST7	x		12	Father is a traditional musical instrument artisan, deceased
8	ST8	x		12	
9	ST9	x		12	-----

2.2. Research tool and validity of the tool

A semi-structured interview questionnaire was designed to examine three key areas, they are: i) students' enthusiasm for learning to craft and play musical instruments; ii) students' understanding of the significance of these activities for cultural preservation; and iii) their ability to apply scientific knowledge in crafting and playing traditional instruments. To ensure the validity and reliability of the questionnaire, the Delphi method was employed with input from 26 experts, including educational consultants, cultural researchers, teachers, and secondary school principals. The evaluation process was carried out in three key stages. The first is questionnaire development and criteria establishment. A set of 23 questions was designed to assess critical aspects of the research topic. Each question was evaluated using five specific criteria. The experts participated in a validation process to assess the validity, importance, and consistency of each item, following the methodology outlined by Zou *et al*. [34]. Secondly, data synthesis and analysis using the knowledge acquisition for multiple experts with time scales (KAMET) method. Expert feedback was analyzed using key indicators, including the median (Mdqi), interquartile range (Qqi), mean (Mqi), and variance (Vqi), with Vqi representing the percentage of experts who modified their ratings between rounds. This analysis was conducted following the guidelines presented in Hsu and Sandford [35]. After the first round of evaluation, four questions failed to meet the criteria due to having $Mqi>3.5$ but $Qqi\geq0.75$, indicating a lack of consensus among the experts. These questions were revised and included in the second round of evaluation. The last stage is post-revision analysis. Following the second round, significant improvements were observed. All questions achieved $Mqi>3.5$, $Qqi\leq0.5$, and $Vqi<15\%$, reflecting both stability and strong expert consensus [36]. These results confirm that the questionnaire possesses high validity and reliability, making it well-suited for achieving the research objectives.

2.3. Data collection and analysis methods

The process for collecting and analyzing data was systematically executed as the following. Step 1 is conducting interviews with each student in their native "E De" language and utilizing the structured questionnaire developed for the study. Step 2 is about to transcribe the interview recordings into text and subsequently translate the transcriptions from "E De" to Vietnamese. The step 3 is performing a detailed analysis of the interview data by categorizing keywords into the predefined variables A1, A2, and A3, using Excel software. Following this, the data from the variable groups were analyzed and compared to assess the evolution of the three variables across the three interview stages, leading to the formulation of conclusions for the study.

2.4. Research ethics

The Ethical Committee of the University of Science and Education, Da Nang University, Da Nang City, Vietnam, approved this study on 10 March 2022. The reference number for this approval is 267/QD-DHSP. This approval ensures that the research adheres to ethical standards.

3. RESULTS AND DISCUSSION

3.1. The evolution of the phase of the impact program

3.1.1. Phase 1: recruitment

Initially, the research team approached the school to propose a research program. However, the school declined the request due to the challenging economic conditions of the majority of students, who were from the "E De" ethnic group. These students worked additional hours to supplement their income, and the high annual dropout rate was a significant concern. Consequently, it was not feasible to involve students in the extracurricular experience program. In response to this rejection, the research team sought the support of the village Elder. The elder endorsed the research program, expressing a shared interest in revitalizing the traditional musical instrument culture of the indigenous people. He mobilized the villagers to participate in the program and designated a location with the architecture of the "E De" longhouse as the venue for implementation. As a result, the number of participating students gradually increased. Even after the program concluded, students continued to visit weekly to practice and teach each other how to use and craft musical instruments.

3.1.2. Phase 2: exploring the characteristics of indigenous traditional musical instrument culture in the Central Highlands and the status of their preservation

To facilitate students' understanding of the characteristics of traditional musical instrument culture and the status of its preservation, the research team assigned the following tasks to groups of students: i) review the provided materials to identify the traditional musical instruments of the "E De" ethnic group; ii) investigate the efforts made by authorities to encourage the community to preserve and maintain traditional musical instruments; and iii) determine if any individuals in the students' surroundings possess knowledge of crafting and using traditional musical instruments. Based on this information, present a perspective on the current state of preserving traditional musical instruments among indigenous peoples in the Central Highlands.

After one week of implementation, nine students engaged in a discussion. The research team found that the students were able to identify several traditional musical instruments from the "E De" ethnic group, recognize that these musical instruments are at risk of disappearing from the community and acknowledge ongoing efforts to preserve these traditional instruments. However, due to difficulties in articulating their views verbally, the students faced challenges in expressing their opinions. Consequently, the research team allowed them to present their perspectives through drawings. This method aligns with the cognitive characteristics of ethnic minority students, as their daily experiences are closely tied to natural phenomena, and their emotional perceptions are well-developed. Hands-on activities combined with visual elements engage them more effectively. The students appreciated the option of answering questions through illustrations. Figure 2 presents photographs of student-created drawings that depict a prominent trend among contemporary youth. The illustrations predominantly emphasize the use of electronic devices, engagement with social networks, and participation in modern entertainment activities. These visual representations highlight a marked decline in interest toward traditional values and cultural practices, such as traditional ceremonies, ancient architecture, and traditional musical instruments. This decline indicates that these cultural elements are becoming progressively neglected and are no longer held in the same regard as in the past.

Figure 2. The paintings drawn by students to depict the preservation situation

3.1.3. Phase 3: learning to craft and use traditional indigenous musical instruments of the Central Highlands

This phase is executed in three distinct steps. Step 1 is about the students become acquainted with traditional musical instruments by observing their use by artisans. They then select the instruments of particular interest to them. Step 2 is about the students receive instruction from artisans on how to play the traditional instruments they are interested in. Step 3 is about the students learn to craft the selected instruments under the guidance of artisans. The artisans impart their practical experience to the students, although they themselves do not possess formal scientific knowledge related to sound. After one month of implementation, all students have achieved proficiency in using several traditional instruments. In terms of crafting, they have successfully created simple instruments, including flutes, *dinh tut*, *chingkram*, and *dinh pang*. Observations reveal that male students generally demonstrate superior crafting skills compared to their female counterparts. Figure 3 shows photographs of the musical instruments crafted by the students themselves. Figure 3(a) represents the musical instrument "*ding pang*". Figure 3(b) represents the musical instrument "*dinh tut*". Figure 3(c) represents the musical instrument "*chingkram*".

(a) (b) (c)

Figure 3. Several traditional musical instruments of the indigenous peoples of the Central Highlands crafted by the students: (a) *Dinh pang*, (b) *Dinh tut*, and (c) *Chingkram*

3.1.4. Phase 4: exploring related scientific concepts through the creation and use of traditional musical instruments

After acquiring skills in using and crafting various musical instruments, all students were tasked with researching materials to address questions related to oscillation, frequency of oscillation, pitch of sound, loudness of sound, the relationship between pitch and the frequency of oscillation, and the dependence of loudness on the amplitude of sound oscillation. Specifically, they were required to apply this knowledge to explain the mechanisms involved in crafting and using the musical instruments they had mastered during phase 3. Students were given time at home to study the learning materials. Upon returning to class, they engaged in discussions about their findings and exchanged ideas regarding any aspects they found unclear. Through these discussions, they consolidated their understanding of the key concepts related to the topic of "sound".

3.2. Interview results

To answer the three research questions, the research team interviewed nine students and collected a total of 27 interview transcripts. After transcribing the interviews, the research team analyzed and coded the students' responses into three groups of data variables (A1, A2, A3).

3.2.1. Group A1

The data of variable A1 focuses on answering research question number 1. The research team has listed and classified the answers that indicated students' interest in learning to use and create traditional musical instruments. Each answer can include a word, phrase, sentence, or multiple connected sentences that reflect the student's direct or indirect interest in this activity. For each such answer, including cases where the preference is repeated in different words in the same answer, variable A1 is counted as 1 point. Example: for the question "Do you enjoy coming here every week to learn how to use and make traditional "E De" musical instruments?", the student answers listed in group A1 in each interview were:

- Direct answers: "I really enjoy learning how to make and use musical instruments"; "Yes, I do"; "Here is no reason not to like coming here to study, ma'am".
- Indirect answers: "I never miss any classes because I look forward to the weekend to learn how to perform musical instruments"; "This class is highly engaging for me"; "I always try to finish all my other

work quickly so I have time to come here to study"; "I always come to class on time without anyone having to remind me"; "My father was a traditional musical instrument artisan, but he passed away. I aspire to become a proficient musical instrument performer like him".

- Repetitive answers: "I really like coming here to study. Overall, this class makes me feel very excited and eager".

All of the answers are worth 1 point. Figure 4 illustrates the A1 variable for nine students across three interviews, revealing a general increase in their interest in learning how to craft and use traditional musical instruments throughout the research program. This indicates that the learning context, "Using and crafting traditional musical instruments of indigenous ethnic groups in the Central Highlands," successfully sparked students' interest in the topic of sound.

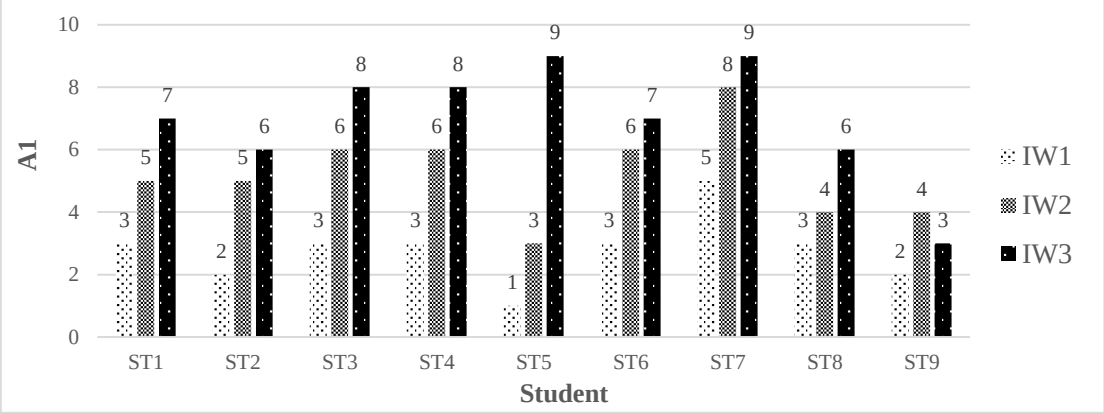

Figure 4. Chart of A1 variable of nine students through three interviews

3.2.2. Group A2

Data of variable A2 answers research question number 2. Similar to variable A1, the research team has listed and classified the answers that show students are aware that "knowing how to use and craft traditional musical instruments of the Central Highlands is a way to preserve them." The research group agreed that the manifestations of this cognition include two aspects: i) The respectful and serious attitude of students towards learning to use and create traditional musical instruments (attending classes fully and on time; being concerned about the decline of traditional musical culture; being conscientious in completing tasks assigned by researchers during the process of learning to use and create musical instruments; having faith that knowing how to create and use musical instruments will contribute to their preservation); and ii) Student's ability to teach others how to craft and use traditional musical instruments for others.

For answers with both expressions, the score of variable A2 is counted as 2, for answers with one expression, the score is counted as 1, and for answers without any expression, the score is 0. For example, With the question: "The state is making great efforts to preserve these traditional musical instruments. Do you think that after mastering the use and crafting of traditional musical instruments, you will contribute to their preservation?", the student's answers were:

- "What can I do, teacher? That's the responsibility of the state" =>A2=0.
- "I have to learn to use and make them well first" =>A2=1.
- "I will learn to perform and make them well, then I will teach my family and friends, I still teach my brother what I know after each lesson, teacher" =>A2=2

Figure 5 presents the A2 variable for nine students across three interviews. The figure indicates a progression in students' awareness of the importance of learning to create and use traditional indigenous musical instruments of the Central Highlands, recognizing that this knowledge contributes to the conservation of these instruments throughout the research process.

3.2.3. Group A3

Data from variable A3 answers the third research question. The research team has listed and classified the answers wherein students employ scientific concepts related to sound to explain the working principles of musical instruments. The basis for identifying an answer as belonging to variable A3 is whether the reasons or explanations related to the scientific concepts of sound are applied to the activities that the students are performing (performing or creating musical instruments).

Scoring for variable A3 is described as: if the student directly answers the question posed, either with a single response or through a dialogue utilizing knowledge about the Sound topic, then variable A3 is counted as 1. For example, using bamboo tubes as the material, the researcher asked the students to create a tube from the ding tut that produces a similar sound to the provided sample tube. During the practice, the researcher asked the question: "Why did you cut the length of this bamboo tube shorter than the sample tube? Wouldn't it be easier to just cut them the same length?". The dialogue between the student and the researcher went as the following:

> "*Look, the diameter of the air column in the bamboo tube you gave us is larger than the sample tube. If I cut them the same length, the sound produced from the tube will be lower than the sound produced from the sample tube*." (A)
> "*So why did you cut it shorter instead of longer than the sample tube?*" (Q)
> "*The shorter the length of the bamboo tube and the smaller the diameter of the air column, the higher the frequency of the sound produced, which leads to a higher perceived sound. Therefore, I had to adjust its length a little bit shorter so that the sounds produced by the two tubes would be similar (same frequency)*." (A)

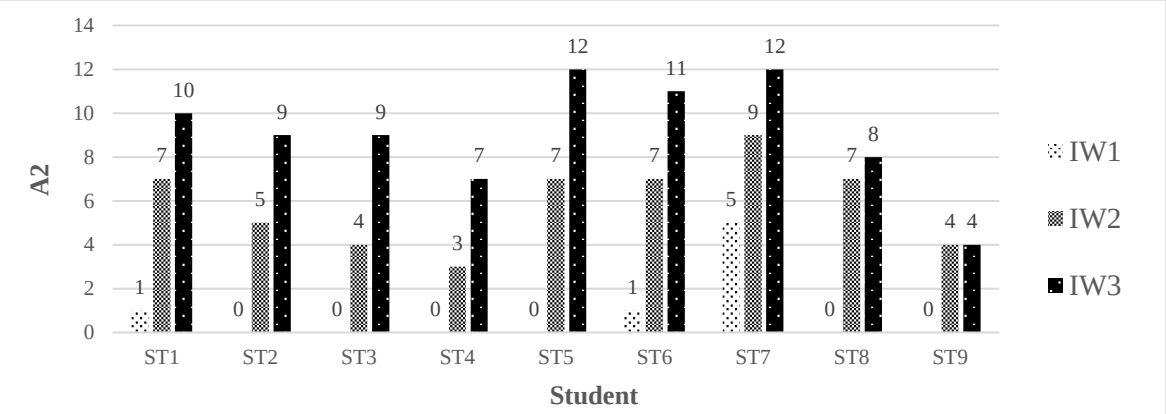

Figure 5. Chart of A2 variable of 9 students through three interviews

For the above dialogue, the value of variable A3 is calculated as 1. If students are unable to answer the question or if they do not use scientific language about the sound topic in their response, even if the description is correct for the phenomenon mentioned, the score of A3 will be 0. Figure 6 shows the values of variable A3 for 9 students across three interviews. Figure 6 shows that in the first interview, the questions did not target variable A3, resulting in all values being 0. During the second interview, students had just completed the phase of learning and crafting musical instruments with artisans. Consequently, their responses relied on everyday language and the artisans' practical experience, which were not scored, leading to no significant increase in A3 values. However, by the third interview, students had acquired scientific knowledge about sound and could apply it to explain the working principles of the musical instruments, resulting in a substantial increase in the A3 values at this stage.

Based on Figures 4 to 6, it is evident that the values of variables A1 and A2 about student ST9 increased from interview IW1 to IW2. However, the values of these variables decreased at IW3. This decrease can be explained by cross-referencing with the field diary, which found that during phase 4 of the program, ST9 was continuously absent for 2/3 of the time due to health problems. This absence could be the cause of the change in variables A1 and A2 of ST9 as presented above, and also explains the lack of increase in variable A3 for this student.

Despite volunteering for the research program, communication with ST5 presented significant challenges for the researchers at the initial stage. ST5 often felt hesitant to interact and express their opinions in front of others. Recognizing ST5's unique characteristics, the research team dedicated more time to ST5 compared to other students. The goal was to build a closer and more trustworthy relationship between ST5 and the surrounding community. The researchers regularly provided support and asked ST5 many questions during the learning process, while also encouraging them to take on the role of group leader in the *chingkram* musical instrument group (*chingkram* being ST5's favorite instrument). This had a positive impact on ST5, who consistently strived to complete tasks and demonstrate their leadership skills. This explains why the

initial values of variables A1, A2, and A3 for ST5 were all at the lowest level, but through three interviews, these values increased significantly and reached the highest position.

ST7 was the smallest student among the nine participants in the research program. The research team initially had concerns about ST7's ability to use tools such as saws, knives, drills, and hammers due to their small size. However, ST7 shared that they had witnessed their father making and playing traditional musical instruments since they were young. They had an ambition to become an artisan like their father. Before participating in the program, ST7's love and awareness of traditional musical instruments had already been shaped and developed within their family. This explains why, in interview IW1, the values of variables A1 and A2 for ST7 were significantly higher than those of other students. Throughout the program, ST7 consistently demonstrated outstanding skills in both making and playing traditional musical instruments. ST7 was the only student in the group who was able to create and play all of the musical instruments displayed in the research program. As a result, the values of variables A1, A2, and A3 for ST7 continuously increased significantly throughout the interviews.

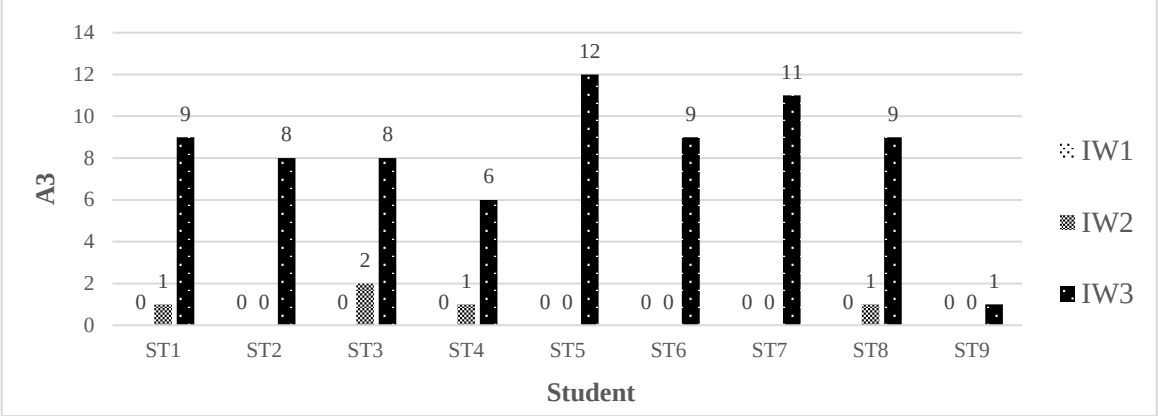

Figure 6. Chart of A3 variable of 9 students through three interviews

3.3. Discussion

The research findings revealed that students demonstrated strong enthusiasm and deep interest in learning to craft and use traditional musical instruments, particularly through the successful application of scientific concepts related to sound. This outcome aligns with previous studies [9], [31], which emphasize the importance of incorporating scientific knowledge into culturally embedded educational programs. Integrating hands-on practice with traditional instruments allows students to better understand theoretical concepts, ultimately enhancing their learning outcomes. By linking these cultural and scientific components, students were able to bridge the gap between their academic learning and real-world applications.

The commitment of students toward preserving traditional musical instruments significantly increased throughout the program, reflecting not only a deeper understanding of their cultural value but also a noticeable shift in attitude. This supports previous research [32], [37], which argue that integrating cultural and social contexts into education fosters greater motivation and deepens students' awareness of practical societal issues. When students recognize that the knowledge they are gaining has tangible applications in preserving cultural heritage, their motivation to engage in both learning and community contributions is amplified. This is consistent with the conclusions from Jennett *et al*. [38].

The study further highlights the importance of selecting learning contexts that align with students' cultural and social backgrounds. As affirmed by Hutchison and McAlister-Shields [39], culturally relevant learning environments significantly enhance students' interest and motivation. In this case, students from ethnic minority groups, who are stewards of traditional musical culture, were encouraged to apply scientific knowledge to address social issues in their communities. This empowerment enabled them to actively contribute to cultural preservation and development, resonating with the findings of Huang and Lajoie [40]. By recognizing the real-world value of their education in improving their communities and preserving cultural heritage, students became more proactive and committed to their academic goals.

One of the study's key findings is the role of students' native language in communication and learning. This approach, consistent with previous research [41], [42] was particularly beneficial for ethnic minority students. Using their native language alleviated linguistic barriers and facilitated more effective knowledge acquisition, especially in contexts where using a second language, such as Vietnamese, posed

challenges. This strategy not only enhanced academic comprehension but also supported the preservation of ethnic minority languages and cultural identities, as indicated by Hutchison and McAlister-Shields [39].

Additionally, the program had broader community implications, drawing significant attention from national media. This aligns with the findings of Radwan [43], which emphasize the critical role of media in raising social awareness and promoting cultural preservation. Media participation helped convey the cultural significance of traditional musical instruments, engaging both the community and the government in the preservation process. Through this platform, cultural messages were both protected and sustained, ensuring their continued transmission to future generations.

The research also found that students continued to voluntarily gather after the program concluded to further their learning and share knowledge about traditional instruments. This demonstrates a sustained commitment to cultural preservation and suggests a long-term trend toward maintaining traditional culture. Ongoing collaboration between schools and communities is crucial, particularly with the involvement of artisans and village elders, who provide authentic and deep cultural knowledge transmission. This collaboration not only enhances technical skills but also strengthens students' connections to their local culture. These findings align with several studies [44], [45], which emphasize the essential role of community collaboration in the success of educational programs focused on cultural heritage preservation.

Practically, the study shows that integrating cultural contexts into educational curricula enhances learning motivation and positively impacts the community by promoting cultural preservation. Theoretically, the research contributes to the body of knowledge on CBL and cultural relevance. Methodologically, the use of native languages and community involvement in education are proven to be effective strategies for increasing the engagement of ethnic minority students in learning. Drawing from the research findings, the following policies and measures are recommended to effectively cultivate students' responsibility for preserving ethnic culture as part of the educational objectives: i) establish and support ethnic music clubs: schools should encourage the formation of ethnic music clubs, providing necessary financial support and learning materials to ensure effective and sustainable operations; ii) teacher training and capacity building: it is essential to organize training sessions for teachers on methods of teaching traditional musical instruments, incorporating local cultural elements, and to involve artisans in the teacher training process; iii) strengthen collaboration between schools and communities: schools should encourage active participation from the local community, particularly artisans and elders with knowledge of traditional musical instruments, in educational activities and preservation efforts; and iv) develop integrated curricula: schools should integrate the teaching of traditional musical instruments into other subjects such as music, history, and civic education, while also creating opportunities for students to engage in related learning projects.

Implementing these recommendations positions educational institutions to play a pivotal role in fostering and cultivating students' sense of responsibility for the preservation of ethnic culture. By adopting these measures, educational settings can facilitate students' understanding and appreciation of cultural traditions while actively encouraging their engagement in the preservation and promotion of these cultural values. This approach ensures that valuable traditions are not only upheld in the present but are also transmitted to future generations, thereby enabling successive cohorts to connect with and value their rich cultural heritage. Consequently, educational institutions will not only fulfill their educational objectives but also make a substantial contribution to the sustainable preservation and advancement of ethnic culture.

4. CONCLUSION

The case study conducted in the village provides empirical evidence of the beneficial effects of CBL on students' engagement, awareness, and application of scientific knowledge in the preservation of traditional musical instruments of indigenous peoples in the Central Highlands. The study underscores the critical role of selecting a learning context that is congruent with both the educational content and the characteristics of the students to effectively meet teaching and learning goals. Inadequate learning contexts can impede the educational process, leading to diminished student interest and motivation. The findings offer valuable insights for educators, particularly those facing challenging conditions, by advocating for a shift in educational approaches and the adoption of contextually appropriate teaching methods.

This research establishes a foundation for educators to confidently implement contextualized teaching strategies aimed at fostering student involvement in addressing cultural issues prevalent in their local communities. By creating a learning environment that promotes critical thinking, empathy, and cultural awareness, educators can support students in becoming responsible citizens who actively engage in community-oriented activities. The limited sample size of the case study presented challenges for quantitative assessment, with data analysis primarily relying on qualitative methods. Consequently, future research will extend the investigation to the mainstream curriculum across several schools in the Central Highlands and will employ quantitative assessments to evaluate students' awareness of cultural preservation, using larger sample sizes and quantitative scales.

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AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

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C : **C**onceptualization
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Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

INFORMED CONSENT

We have obtained informed consent from all individuals included in this study.

ETHICAL APPROVAL

The Ethical Committee of the University of Science and Education, Da Nang University, Da Nang City, Vietnam has granted approval for this study on 10 March 2022 (Ref. No. 267/QD-DHSP).

DATA AVAILABILITY

The data that support the findings of this study will be available in audio recordings of the interviews [https://drive.google.com/file/d/1CVEwNukVRSmojMUTzdan7n-N-nXAuqmx/view?usp=sharing] and analyzing interview data [https://docs.google.com/spreadsheets/d/1zm8teKuGZW51PQQ-m8bFMpDMATg8vQLL/edit?usp=drive_link&ouid=109196658158863722182&rtpof=true&sd=true] following a 6 month embargo from the date of publication to allow for the commercialization of research findings.

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