

# Technological Transformation and Student Engagement in Tennis Training: Basis for Strengthening Sports Educational Program

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**Abstract:** The researcher aimed to examine how technological transformations impacted student engagement in tennis training at selected Chinese schools and strengthened sports educational programs. They sought to evaluate respondents' profiles, their assessment of technological transformations in tennis training, and the influence of these changes on student engagement, while also exploring potential differences based on respondent profiles and designing effective sports programs based on the study's findings. The researcher used a descriptive correlational research and quantitative method and utilized teachers or coaches and students of the selected universities and colleges in China such as the Yulin Normal University, Guilin Normal College and Guangxi Normal University. The study found that while technological transformations in tennis training were only slightly implemented and had a moderate impact on student engagement, there were notable differences in assessments based on gender, role, and age. To enhance student engagement, it is crucial to design a more comprehensive sports educational program that effectively integrates technology. Furthermore, to improve student engagement in sports education, schools should design and implement targeted, inclusive technology integration strategies that address the needs of diverse demographics, provide effective training, and continuously assess and adapt technological tools based on feedback.

**Keywords:** Technological Transformation; Student Engagement; Tennis Training; Sports Educational Program.

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## 1. Introduction

Tennis training has been an integral part of sports education programs in schools worldwide including China. However, with the advent of technology, there has been a significant transformation in the way tennis training is conducted among different schools. The use of technology in tennis training has revolutionized the way coaches, players and school approach the game. In the Chinese school setting, technological transformation in tennis training has become increasingly important to enhance student engagement and strengthen the sports educational program.

Functional training and conventional training led to improvements in strength and power (Xiao, et. al., 2023). Moreover, the influence of technological transformation in tennis training involves the use of various tools and equipment to improve the quality of tennis training including video analysis software and wearable technology such as smartwatches and fitness trackers. These technological tools can be used to monitor a player's performance, track progress over time and analyze a player's technique and identify areas that need improvement. These technological advancements have made it easier for coaches to provide personalized training to each player that can lead to better results.

The Zhang Zhizhen, Wu Yibing, and Zheng Qinwen attributed success to participation in high-level domestic and international tournaments which has examined the growth characteristics of elite tennis players (Chen, et. al., 2023). Student engagement is a crucial aspect of any sports educational program to improve characteristics of tennis players. In tennis training, student engagement can be enhanced through the use of technology like gamification in training sessions more fun and interactive. Virtual reality can also be used to simulate real-life game situation for students

to develop their skills in a safe and controlled environment. By using technology to enhance student engagement, coaches can create a more enjoyable and effective learning experience for their students as supported by the administrators.

Research on student engagement in China has highlighted the significant influence of teacher support on students' academic engagement including physical education where sports are relevant (Pan and Yao, 2023). Teacher support, coaching, mentoring and teacher-student rapport playing a crucial role in boosting student engagement. The context of tennis training encompasses various aspects, including technical skill development, cognitive benefits, and participation initiatives in which teaching methods combined with stepped assessment can be effective in training students in specific tennis techniques, such as folding and sprinting (Huang, et. al., 2023). Additionally, tennis training experience has been associated with improved executive function with long-term training linked to enhanced decision-making skills and faster response times (Xu, et. al., 2022). Ergo, the introduction of tennis programs in schools can help increase interest and engagement with the sport in China. Overall, the discussions in the context of tennis training encompasses not only the social, technical and cognitive aspects of training but also the broader impact of tennis participation initiatives in the educational setting.

In the Chinese school setting, the integration of technological transformation and student engagement in tennis training can strengthen the sports educational program as well as better understanding of the factors influencing active participation in tennis in China (Li, et. al., 2022). By using technology to enhance training and student engagement, necessity to develop their skills more effectively and efficiently when supported by secured environment. This can lead to better performance on the court and a greater

appreciation for the sport. Additionally, the use of technology can help coaches identify talented players and provide them with the necessary support to excel in the sport.

Generally, technological transformation and student engagement are essential components of tennis training in the Chinese school setting. By embracing these advancements, coaches can provide a more personalized and effective training experience for their students. This can lead to better performance on the court and a stronger sports educational program overall. The present study collectively contributes to a better understanding of the effectiveness of sports educational programs, the development of elite tennis players, and the factors influencing student engagement in the Chinese context.

China has made significant progress in upgrading the facilities for digital teaching in schools having access to the internet to better apply information technology to education. In the 20th National Congress of the Communist Party of China calling for the digitalization of education, a public online service platform named "Smart Education of China" was officially launched, focusing on learning, teaching, and other areas which is expected to further promote the digitalization of education in China. Despite these advancements, the gap between rural and urban education systems remains a long-standing challenge in China, and reducing this education gap remains critical to China's future wherein sports education program is affected (Aisyah, 2021; Zhou, 2022). Hence, Chinese government is also concerned with sports activities to support future active leaders of the nation.

China is striving to become a leading sports nation, and policies and programs have been implemented to improve physical activity among students. However, there is still room for improvement including organized sports and physical activity within a safe community and environment. Sports participation is positively correlated with academic performance in Chinese wherein as to extracurricular participation it is viewed as important in Chinese college students, and school size and poverty levels significantly influence the number and types of activities available (Xiang, et. al., 2023; Zhang, et. al., 2023; Ren, et. al., 2021). Hence, Chinese school and government sectors are both appreciative of the need for physical activities in the academic setting.

Tennis training is becoming increasingly popular among young people in China. According to a report by the International Tennis Federation, China contributed 22.5% of the world's tennis population mostly from shanghai (Li, et. al., 2022). However, training a professional tennis player outside of national sports can be expensive which most Chinese families cannot afford and rely on scholarships whenever tennis is part of the school curriculum. Despite this, some families see tennis as a way to gain an advantage when it comes to getting into Universities in China or other countries. Therefore, tennis has become popular sport where a focus of Chinese state policy and investment is necessary.

The importance of sports education programs among Chinese schools is increasingly recognized for several reasons like its crucial role in the physical and mental development of students which is fundamental to overall development and impacts the physical and mental health of youth (Xiang, 2022). Therefore, integrating sports into the education system can contribute to the well-being of students and their long-term health. Sports education programs can help cultivate good exercise habits and sports appreciation

including tennis. The Chinese government has been actively promoting the development of physical activities in youth supported by various policy documents to strengthen school sports work and improve students' physical fitness. By providing structured sports education programs which includes tennis, schools can contribute to the establishment of healthy exercise habits leading to long-term benefits for the students' health and well-being.

Including tennis in the sports education program is important for several reasons as to developing physical literacy by improving components in the context of strength, flexibility, coordination, speed, and agility that are essential for overall athletic development. It is also a non-impact sport, suitable for all ages and skill levels, and can be played for a lifetime, making it a great way to maintain health and fitness. Furthermore, playing tennis can contribute to reducing stress, enhancing well-being, and decreasing symptoms of anxiety and depression, particularly in students. Additionally, tennis provides social benefits when meeting people, spending time with friends since it is considered as a recreational activity. Therefore, including tennis in the sports education program can contribute to the overall physical, mental, and social development of the students.

Generally, sports education programs can also have social and cultural benefits because of student engaging in sports activities leading to making friends, widen their social circle, and learn important values such as teamwork, discipline, and resilience. Moreover, sports can be a means to learn about Chinese culture and language, providing opportunities for students to engage in physical activities while also learning about the cultural significance of certain sports despite technological transformation. In conclusion, sports education programs are important in Chinese schools as they contribute to the overall development, physical and mental well-being, and social growth of students as well as help them cultivate healthy habits and provide valuable social and cultural experiences.

With this, the researcher was motivated to explore the technological transformation and student engagement in tennis training among Chinese School that helps strengthen the sports educational program. Specifically, the study dwells on the assessment of the respondents on the implementation of technological transformations of tennis training in selected Chinese schools. Moreover, the study also determined how can these technological transformation influence student engagement in sports educational programs. Furthermore, the result of the study, was used to identify what sports educational program can be designed to strengthen student engagement with the aid of technological transformation.

## 2. Statement of the Problem

The researcher was motivated to explore the technological transformation and student engagement in tennis training among Chinese School that helps strengthen the sports educational program.

Specifically, the researcher sought to answer the following questions;

- 1.What is the profile of the respondents in terms;
  - 1.1Age;
  - 1.2Sex; and
  - 1.3Respondent Classification?

- 2.What is the assessment of the respondents on the implementation of technological transformations of tennis training in selected Chinese schools as to the following

- components;
- 2.1People;
  - 2.2Processes; and
  - 2.3Technology?
- 3.Is there a significant difference on the assessment of the respondents on the implementation of technological transformations of tennis training in selected Chinese schools when profile variables are used as the test factor?
- 4.How do respondents assess the influence of technological transformation on student engagement in sports educational programs as regards to;
- 4.1Attention;
  - 4.2Relevance;
  - 4.3Confidence; and
  - 4.4Satisfaction?
- 5.Is the assessment of the respondents on the influence of technological transformation on student engagement in sports educational programs significantly different when grouped according to profile?
- 6.Is technological transformations influence the student engagement in tennis training?
- 7.Based on the result of the study, what sports educational program can be designed to strengthen student engagement with the aid of technological transformation?

3. Research Design

The study used the quantitative research method and employs a descriptive correlational research design. The quantitative research method is used in this study because gathering and evaluating numerical data is the process that will be applied by the researcher. It is useful for determining trends and averages, formulating hypotheses, examining

causality, and extrapolating findings to larger populations. As explained by Question Pro (2024), quantitative research is gathering measurable data and applying statistical, mathematical, or computer methods to analyze the data in a systematic way. Significant statistical data is gathered through quantitative research. Inferential statistics are employed in quantitative research to draw conclusions that can be generalized to a larger population.

Moreover, the researcher employs the descriptive correlational design since the study seeks to establish the relationship between two variables and give static representations of situations. As discussed by the SCISPACE (2024), one way to look at the link between variables and explain their traits or behaviors is to do descriptive correlational research. By collecting information via surveys or observational techniques, it seeks to provide an answer to the question "How are things related?" While observation entails physically witnessing behaviors in real-time, surveys are an effective tool for gathering information about people's experiences, beliefs, and attitudes. There is no manipulation of the variables of interest in this study strategy. It emphasizes on data analysis, trend and relationship identification, and the description and interpretation of current conditions and situations.

The researcher used this method and design since it is commonly used in education to address problems and improve classroom instruction as well as to achieve the study's main objectives.

4. RESULTS AND DISCUSSIONS

1.Profile of the Respondents

| Table 1. Profile of the Respondents as to Age, Sex and Classification |           |            |
|-----------------------------------------------------------------------|-----------|------------|
| AGE                                                                   | FREQUENCY | PERCENTAGE |
| 20 and below                                                          | 891       | 63.4       |
| 21-30                                                                 | 447       | 31.8       |
| 31-40                                                                 | 41        | 2.9        |
| 41 and above                                                          | 27        | 1.9        |
| Total                                                                 | 1406      | 100.0      |
| SEX                                                                   | FREQUENCY | PERCENTAGE |
| Male                                                                  | 340       | 24.2       |
| Female                                                                | 1066      | 75.8       |
| Total                                                                 | 1406      | 100.0      |
| CLASSIFICATION                                                        | FREQUENCY | PERCENTAGE |
| Student                                                               | 1312      | 93.3       |
| Teacher                                                               | 94        | 6.7        |
| Total                                                                 | 1406      | 100.0      |

Table 1 presents the profile of the respondents as to age. Data shows that the majority of respondents are aged 20 and below with 891 individuals or 63.4% of 1406, which may be students enrolled in tennis classes or tennis players This means that most of the respondents are Gen Z, who are known for their digital fluency and strong connection with technology. On one hand, those aged 41 and above, which represent the older segment of Generation X or Baby Boomers, comprise the lowest frequency with 27 frequency or 1.9% of the total, which may be the coaches or teachers.

The age distribution shows that most of the respondents in

the study are from younger generations, especially Generation Z, which may be students. This concentration implies that technological transformations in tennis training are most relevant to and impact the student population, who form the bulk of the respondents. Generation Z's strong presence indicates that they are the primary beneficiaries of these technological advancements due to their familiarity with digital tools. The lower number of respondents in the older age groups, particularly those over 40, could indicate a lesser involvement of more experienced Generation X and Baby Boomer teachers and coaches in the study, or a potential gap

in their adoption of new technologies. However, the presence of these older generations is crucial because they bring valuable experience and traditional coaching perspectives, which can complement the integration of new technologies. This aligns with the study by Joshi (2023) indicating that Generation Z, who have grown up with technology, are more receptive to digital tools and innovations in educational settings. Their familiarity with technology could make them more engaged with digital tools in tennis training, which could enhance their learning and performance. On the other hand, the lower number of older generations, such as Generation X and Baby Boomers, could reflect a hesitancy or lack of access to technological resources. This is a challenge noted in the study by Ramos (2024), which underscores the need for professional development and training opportunities to ensure these educators can utilize new technologies effectively.

It is evident that respondents are mostly Generation Z, showing that new technology in tennis training affects students the most. However, to make sure these changes help everyone involved in tennis education, it's important to provide training and support to older generations, especially Generation X and Baby Boomer coaches and teachers. This will help close the technology gap and improve sports education for all age groups in schools.

As to sex. Data reveals a clear gender imbalance, with 1,066 individuals, or 75.8% of the respondents being female and only 340 individuals, or 24.2% being male. This indicates that there are more female participants in the study, which may emphasize that women are more involved or available for tennis training and education in selected universities and colleges in China, such as Yulin Normal University, Guilin Normal College, and Guangxi Normal University.

The large difference in the number of males and females might show wider patterns in sports education and participation at Chinese universities. The higher number of female respondents could indicate a greater interest or involvement of women in tennis programs at the surveyed institutions. This aligns with international movements that have been encouraging greater female involvement in sports through policy changes and societal shifts. The positive trends in female sports participation are also seen in educational settings, where gender equality efforts have gained momentum, leading to more opportunities and support for women in sports programs (Robson, 2023). The lower percentage of male respondents indicates the need to encourage more male participation in tennis programs, or perhaps reflect a focus on sports more traditionally dominated by men, such as soccer or basketball, which might divert male engagement away from tennis. This idea is supported by Scharfenkamp et al. (2022), who highlight how male dominance in grassroots sports volunteering can create barriers for women and shape men's engagement, often steering them towards traditionally masculine sports environments. Similarly, Allison & Knoester (2021) note that sports fandom and participation are often gendered, with men more likely to identify as passionate sports fans, which could influence their preference for certain sports over others like tennis. This connection implies that societal norms and gender roles play a significant part in shaping sports participation across different activities. The difference also raises questions about barriers for each gender that might affect participation in tennis and sports education, which could be an area for further study.

The gender disparity in this study's sample implies that while female participation in tennis training is strong, there may be a need to explore the factors influencing lower male participation. Future efforts could focus on promoting tennis as a gender-neutral sport, ensuring that both male and female students have equal opportunities and encouragement to participate. Addressing barriers to male involvement in tennis could contribute to a more balanced gender representation, thereby enhancing the effectiveness and inclusivity of sports educational programs in Chinese universities.

As to classification. Data reveals that the majority of the respondents are students, with 1312 frequency or 93.3% of the total sample. In contrast, teachers constitute only 94 individuals, or 6.7% of the total respondents. This disparity emphasizes that the study is predominantly student-focused, reflecting a broader engagement or availability of students in tennis training and education within these institutions.

This student representation is relevant to the study's goal of exploring technological transformation and student engagement in tennis training. The high number of student participants ensures that the study captures a wide range of student experiences and perceptions regarding how technology impacts their engagement in tennis. The lower participation of teachers implies that the study is more focused on the direct beneficiaries of tennis training — students — rather than the facilitators. However, this also points to a challenge in understanding how teachers perceive and implement technological tools in their coaching practices. According to Pandita & Kiran, (2023) engaging both students and educators is crucial for the successful implementation of technology-driven programs.

The classification distribution highlights the central role of student perspectives in shaping the study's findings on the impact of technological transformation in tennis training. To gain a more comprehensive understanding, future studies could aim to increase teacher participation, providing insights into how technology influences both teaching practices and student outcomes. This approach could lead to more effective strategies for integrating technology into sports education programs, which could strengthen student engagement and performance.

**Determination of Technological Transformations in Tennis Training Implemented among Chinese School.**

Table 2 provides an assessment of the respondents on Technological Transformations in Tennis Training Implemented among Chinese Schools as to People. Data reveals that the implementation of these technological changes is rated as "Slightly Implemented" across combined means for both students and teachers, but teachers viewed indicators 1, 3, and 5 as implemented. The highest combined mean of 2.40 with a 0.62 SD is observed in the fifth indicator, which assesses the presence of support staff, such as fitness trainers, physiotherapists, and counselors, involved in integrating technology into tennis training. This implies that while this aspect is implemented, it still falls short of being fully effective. The third indicator, concerning how well parents and guardians are informed about the sports program to create a supportive environment, follows with a combined mean of 2.36 and a 0.59 SD, reflecting a "slightly implemented" interpretation. In addition, the first indicator, which evaluates how effectively teachers, administrators, coaches, and trainers adapt and integrate technology into tennis training, has a combined mean of 2.33 with a 0.58 SD, indicating that this integration is perceived as only slightly

established. On one hand, the lowest combined means are observed in the second and fourth indicators, both at 2.31, with SDs of 0.63 and 0.60, respectively. These indicators focus on encouraging students to be receptive to technological advancements and conducting open dialogues with parents, guardians, and sports experts, emphasizing that these areas are perceived as slightly implemented. The composite mean shows that students see the overall implementation of

technological changes in tennis training as "Slightly Implemented," with a mean of 2.33 and a 0.45 SD. Teachers, however, rated it a bit higher, considering it "Implemented" with a mean of 2.51 and a 0.25 SD. The combined composite mean value of 2.34 with a 0.44 SD implies that while some technological changes have been put in place, they are not fully effective. Students, in particular, feel that the use of technology in tennis training is only partially happening.

**Table 2.** Technological Transformations in Tennis Training Implemented among Chinese School as to People

| INDICATORS                                                                                                                                                                                                      | CLASSIFICATION | MEAN | SD   | INTERPRETATION       | RANK |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------|------|----------------------|------|
| 1. Teachers, administrators, coaches and trainers in Chinese schools effectively adapt and integrate technology into tennis training.                                                                           | Student        | 2.30 | 0.58 | Slightly Implemented | 3    |
|                                                                                                                                                                                                                 | Teacher        | 2.67 | 0.52 | Implemented          |      |
|                                                                                                                                                                                                                 | Combined       | 2.33 | 0.58 | Slightly Implemented |      |
| 2. Trainers and coaches encourage student to be receptive in adapting technological advancements in tennis training.                                                                                            | Student        | 2.30 | 0.63 | Slightly Implemented | 4.5  |
|                                                                                                                                                                                                                 | Teacher        | 2.36 | 0.50 | Slightly Implemented |      |
|                                                                                                                                                                                                                 | Combined       | 2.31 | 0.63 | Slightly Implemented |      |
| 3. Parents and guardians are well-informed of the sports program to enhance a supportive environment in using technology in tennis training programs.                                                           | Student        | 2.34 | 0.60 | Slightly Implemented | 2    |
|                                                                                                                                                                                                                 | Teacher        | 2.56 | 0.52 | Implemented          |      |
|                                                                                                                                                                                                                 | Combined       | 2.36 | 0.59 | Slightly Implemented |      |
| 4. Open dialogue is conducted to gather the opinion on the level of support and understanding from parents, guardians and sports experts regarding the use of technology in tennis training in Chinese schools. | Student        | 2.30 | 0.61 | Slightly Implemented | 4.5  |
|                                                                                                                                                                                                                 | Teacher        | 2.41 | 0.52 | Slightly Implemented |      |
|                                                                                                                                                                                                                 | Combined       | 2.31 | 0.60 | Slightly Implemented |      |
| 5. Presence of support staff (e.g., fitness trainers, physiotherapists, counselors) involved in integrating technology into tennis training process.                                                            | Student        | 2.39 | 0.62 | Slightly Implemented | 1    |
|                                                                                                                                                                                                                 | Teacher        | 2.54 | 0.56 | Implemented          |      |
|                                                                                                                                                                                                                 | Combined       | 2.40 | 0.62 | Slightly Implemented |      |
| Composite Mean                                                                                                                                                                                                  | Student        | 2.33 | 0.45 | Slightly Implemented |      |
|                                                                                                                                                                                                                 | Teacher        | 2.51 | 0.25 | Implemented          |      |
|                                                                                                                                                                                                                 | Combined       | 2.34 | 0.44 | Slightly Implemented |      |

LEGEND: HIGHLY IMPLEMENTED (4) =3.51-4.0); IMPLEMENTED (3) =2.51-3.50); SLIGHTLY IMPLEMENTED (2) =1.51-2.50); NO IMPLEMENTATION AT ALL (1) =1.0-1.50)

The slight implementation across all indicators points to a need for an improvement in how technological transformations are being integrated into tennis training within Chinese schools. While the presence of support staff is recognized, the overall impact of these technological changes on student engagement remains limited. According to Njiku et al. (2022), one significant barrier to effective technology integration is insufficient training for teachers. Rahmat et al. (2023) emphasizes that although technology has the potential to enhance student engagement and comprehension, its successful implementation largely depends on educators' ability to adapt the curriculum and personalize digital content to meet students' needs. According to Syaharuddin et al.,

(2022), successful technology integration in sports training requires the provision of resources and active engagement from all stakeholders, including students, parents, and educators. This collaborative approach is essential for fostering an environment where technology can be effectively utilized to enhance sports training. Moreover, the lower ratings in student receptivity and parental engagement underscore that these key components are not being adequately addressed, which could hinder the effectiveness of the overall sports education program. Studies have shown that parental involvement is crucial for student engagement and motivation, particularly in educational settings that involve physical activities like sports. According to Yang et al. (2023)

when students and parents are not fully engaged, it becomes challenging for programs to meet their goals effectively. This underscores that when students feel less supported by their parents or the school environment, they are also less motivated, which can result in lower academic and athletic performance. This lack of engagement limits the potential of technology-enhanced sports programs to improve student outcomes and maximize participation.

The assessment of respondents on the implementation of technological transformations in tennis training in selected Chinese schools, specifically regarding the "People" component, indicates that these efforts are only slightly implemented. This means that while some progress has been made in integrating technology, particularly with the involvement of support staff, there remains a need to fully engage all stakeholders. To improve the effectiveness of these technological transformations, schools may invest in more comprehensive training for educators, increase student receptivity through active engagement strategies, and involve parents and guardians in the process. Addressing these areas is important for building a more supportive and unified environment where technology can be successfully integrated into tennis training programs.

## 5. Conclusion

Based on the significant findings of the study, the following conclusions were established:

1. It is evident that the majority of the respondents are Generation Z, female students. This finding highlights the need to tailor technological innovations in sports education to this group while also considering strategies to boost male participation and teacher involvement for a more balanced approach in Chinese universities and colleges.

2. The implementation of technological transformations in tennis training in selected Chinese schools is slightly implemented across People, Process, and Technology components. This means that technology integration into tennis training is insufficient and that more comprehensive efforts are needed to fully realize its benefits.

3. The assessment of the implementation of technological transformations in tennis training varies significantly on sex and classification, but not by age. This means that gender and the role of the respondent (student or teacher) influence perceptions of how technology is integrated into training, while age does not make a difference in assessments.

4. Respondents assess the influence of technological transformation on student engagement in sports educational programs as "Moderately Influential." It means that technology is recognized but has less impact on student engagement in sports education. This implies that while technology does make a difference, there is room for enhancement to achieve more significant improvements in student engagement.

5. There are significant differences in how respondents assess the influence of technological transformation on student engagement in sports education, based on age, gender, and classification. This finding implies that demographic factors play a crucial role in shaping perceptions of technological integration in education, indicating the need for inclusive strategies to maximize its benefits across different groups.

6. Technological transformations influence student engagement in tennis training but the impact is moderate. This means that technology helps improve student engagement in

tennis training, but more comprehensive and effective integration strategies are needed to maximize its benefits.

7. There is a strong positive correlation between technological transformation and student engagement, indicating that as technology is increasingly integrated into educational environments, student participation and motivation significantly improve. This implies that technological advancements are not merely supplementary but essential to enhancing student engagement. The personalized learning opportunities, collaborative tools, and interactive methods offered by technology create more dynamic, student-centered environments, leading to deeper involvement in learning activities and improved academic outcomes.

8. There is a need to design a sports educational program that integrates technology to strengthen student engagement.

## 6. Recommendations

In the light of the findings of the study and conclusions drawn, the following recommendations are advanced:

1. Implement targeted technological innovations in sports education that cater specifically to Generation Z female students. At the same time, develop strategies to encourage male participation by incorporating sports that traditionally appeal to male students, such as soccer or basketball, alongside tennis. In addition, provide training and resources to teachers that ensure they can utilize these technological tools, fostering a more inclusive and balanced sports education environment in Chinese universities and colleges.

2. Develop and implement training programs for teachers, coaches, and other stakeholders to enhance their skills in using technological tools. Include workshops, ongoing professional development, and support systems in these programs. Review and update training processes and curricula to integrate new technologies, ensuring alignment with available tools. Allocate more resources toward acquiring, maintaining, and updating technological equipment, and provide necessary technical support. Launch awareness campaigns to inform and engage stakeholders about the benefits and potential of these technological tools. By addressing these areas, schools can achieve better integration of technology into tennis training helping them fully realize the benefits it offers.

3. Create technology strategies that consider gender and role-specific training materials. Make training materials and support that suit these differences to improve engagement and effectiveness. Since age doesn't significantly affect perceptions, addressing the needs of different genders and roles will help make technology integration in tennis training more effective.

4. Develop interactive and immersive technology tools, such as virtual reality simulations and gamified learning platforms, to make learning more engaging and relevant. Providing comprehensive training for both teachers and students on the effective use of these tools will ensure that they will be well-prepared to use technology in sports education. Customize technology to align with students' specific needs and interests, and incorporating their feedback, will help maintain relevance and effectiveness. In addition, continuous assessment of the technology's impact on student engagement should be conducted to make necessary adjustments and improvements. Encourage collaborative learning experiences through technology, where students can work together on projects and share insights, will further

enhance engagement and motivation. By using these strategies, schools can improve how technology is used and make a bigger difference in keeping students interested and engagement.

5. For Institutions and training programs: Develop inclusive programs that address the diverse perceptions of technological transformation across different age groups, genders, and classifications. Tailor technology integration to meet the specific needs of younger, older students, and also teachers, and ensure that training and support are accessible to all. In addition, implement a gender-sensitive approach that recognizes how males and females engage differently with technology. By creating customized programs and resources, schools can maximize the benefits of technological integration and enhance student engagement for all demographics.

6. Develop and implement comprehensive and targeted strategies for integrating technology. Focus on using advanced technological tools that align with training objectives, provide professional development for instructors to use these tools effectively, and engage students in the adoption process to ensure technology meets their needs. These steps can enhance the impact of technology on student engagement in tennis training.

7. Prioritize the integration of technology into the curriculum and teaching methods. School leaders should allocate resources to upgrade digital infrastructure, ensuring all students have access to necessary tools such as learning management systems, educational apps, and interactive platforms. Teachers should receive professional development and ongoing training to effectively incorporate these technologies into their lessons. Additionally, collaborative projects and personalized learning modules should be designed to foster student engagement. This approach will create a more dynamic, inclusive, and student-centered environment, leading to enhanced learning outcomes. Schools may also collaborate with technology providers and educational consultants to ensure the proper implementation and sustainability of these initiatives.

8. Design a sports educational program that integrates technology to enhance student engagement. Focus on creating engaging and interactive technological tools and resources tailored to students' needs. Ensure the program addresses varying demographics and promotes inclusive participation by incorporating feedback from students and teachers to refine technological integration. This approach will help strengthen student engagement and maximize the benefits of technology in sports education.

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