COLLISION OF VIRTUAL REALITY BASED INSTRUCTION ON BIOLOGY STUDENTS MOTIVATION IN SECONDARY SCHOOL IN ILORIN, KWARA STATE

Abidoye, Florence O. [1], Aladesuyi David A. [2], Afolabi Kayode O. [3]

Department of Science Education, Faculty of Education, University of Ilorin, Nigeria

Correspondence:
Abidoye, Florence O.
Department of Science Education, Faculty of Education, University of Ilorin, Nigeria
abidoye.fo@unilorin.edu.ng;
aladesuyi20@gmail.com;
afolabi.ko@unilorin.edu.ng

Submitted: Feb 08, 2024
Revised: Mar 28, 2024
Accepted: Apr 03, 2024

Abstract

This study examined how biology students' motivation was affected by virtual reality (VR) at secondary schools in Ilorin, Kwara State. 544 pupils from 20 secondary schools that were purposefully chosen made up the sample. Data is gathered using the Instructional Materials Motivation Survey (IMMS), which is based on Keller's ARCS motivation paradigm. Descriptive and inferential statistics (mean and standard deviation), and a t-test were used to analyze the collected data. The findings of the study revealed unveiled that the implementation of virtual reality-based instruction has a significant impact on the motivation of biology students in secondary schools. Moreso, the attention and satisfaction categories had the most favorable replies, indicating that VR has a considerable impact on students' motivation, according to the results. There are gender disparities in attention, with females showing higher levels. Therefore, the study suggests incorporating virtual reality (VR) into teaching methods and creating inclusive VR experiences that appeal to both male and female students.

Keywords: Collision, Virtual Reality Based Instruction, Biology, Motivation

1. Introduction

Virtual Reality (VR) is an all-encompassing and all-pervasive technological wonder that has undoubtedly made a profound and indelible impact on a myriad of professionals in an extensive array of vocations, including but not limited to the esteemed fields of medicine, engineering, aviation, military, and, more recently, librarianship, to name just a few. As per the scholarly analysis conducted by Nowak (2020), the very origins of augmented and virtual reality can be traced back to the distant year of 1838, when the ingenious invention of the stereoscope took the world by storm. This groundbreaking gadget bestowed upon its users the remarkable ability to marvel at an object or entity, seemingly imbued with a genuine sense of three-dimensionality, thereby creating an unparalleled sense of depth and realism. Furthermore, the esteemed scholar Mistchell (2020) eloquently characterized VR as an awe-inspiring computer-generated simulation, one that permits individuals to actively and meaningfully interact with an artificially crafted three-dimensional milieu by means of an assortment of cutting-edge technological contrivances, prominently including but not limited to specialized eyewear that boasts an embedded screen, as well as gloves that are equipped with an array of highly sophisticated

sensors, thus truly exemplifying the epitome of technological advancement and innovation. It is crucial to acknowledge that VR is fundamentally rooted in computer systems, which are able to construct and visualize alternative realities by virtue of powerful simulations that effectively mimic real-life situations (Martín-Gutiérrez, 2017).

Simultaneously, exposing students to these emerging technologies enables them to become increasingly familiar with the demands of Industry 4.0 (Sari, 2020), ultimately empowering them to cultivate the competencies and skills required for effective navigation of real future scenarios (Flores, 2014). Consequently, educational institutions are progressively venturing into the exploration of these innovative technologies, particularly in the context of abstract content that often poses challenges for students in terms of comprehension.

Tchaikovsky and Izotova (2020) also make a noteworthy observation regarding the potential expansion of inclusive education through the utilization of immersive learning technology. In addition to their capacity to enhance conventional learning systems, virtual reality (VR) tools can make a significant contribution towards the integration of students with disabilities into the learning process as well as professional activities. Several researchers have identified a range of unique capabilities associated with VR, including the ability to immerse oneself in a simulated environment, engage in multimodal interaction, concretize imagination, embody experiences, and foster empathy (Pellas et al., 2021). It is worth noting that VR has the ability to enhance empathy and create a sense of embodied presence for its users (Pellas et al., 2021).

Upon conducting an in-depth examination of the impact of virtual reality, a number of researchers (Qushem et al., 2021) have uncovered a variety of benefits that can be derived in terms of knowledge acquisition, commitment, motivation, and academic performance. This alternative approach to education holds additional value due to its ability to accurately represent three-dimensional virtual objects and provide students with the opportunity to model the operations and procedures associated with abstract concepts (Christopoulos et al., 2018; Qushem et al., 2021). The immersive experience facilitated by VR technology enhances the memorization of complex or abstract topics that are based on intangible concepts (Dick, 2021). Such experiences not only increase motivation and engagement, but also result in emotional satisfaction (Morimoto and Ponton, 2021). It is important to highlight that the active involvement of students in educational activities is a crucial requirement for effective learning (Khan et al., 2017).

Certain researchers place emphasis on the fact that interaction with three-dimensional visualizations evokes positive emotional experiences, ultimately leading to improved learning outcomes and increased levels of motivation (Reinke et al., 2021). These emotional events have the potential to enhance memorization (Parong and Mayer, 2018; Reinke

et al., 2021), and the positive emotional experiences typically associated with such interactions often translate into improved academic performance. Furthermore, the positive emotions elicited by the use of augmented reality (AR) can strengthen internal motivation to learn. Educational immersive tools possess immense potential for training students of various ages and specializations (Huang et al., 2019; Dick, 2021).

Several studies have been done on virtual reality-based instruction (Crouch, 2014; Devon & Mühlenen, 2018; While Crosier, Cobb and Wilson, 2001; Merchant, Goetz, Cifuentes, & Davis, 2013; Elinda, Kok Wab & Chun, 2010; Tasneem, Kevin & Jacques, 2019) but did not address the study under investigation. In addition, Jang Hee, and Olga (2019) conducted research on the impact of VR applications on students' competency development. Also, Lund and Wang (2019) conducted a research on effect of Virtual Reality on learning motivation and academic performance.

Study could only find one study with a similar title conducted by by Garduño et al., (2021) but focused on chemistry as a science subject in high schools and was carried out in Mexico**.** It is against this, that this study examined the collision of virtual reality based instruction on biology student motivation in secondary school in Ilorin, Kwara State. The following are the Specific objectives of the study:

1) Collision of virtual reality based instruction on biology students motivation in secondary school in Ilorin, Kwara state
2) The dimension of motivation that is generated impact student by using VR for the study of biology in secondary school.
3) Gender influence students perception on collision of virtual reality based instruction on biology student motivation in secondary school in Ilorin, Kwara state

1.1 Research Question

The following questions were answered in this research study

1) What is the collision of virtual reality based instruction on biology students' motivation in secondary school in Ilorin, Kwara state?
2) How does dimension of motivation generated impact student by using VR for the study of biology in secondary school?
3) Does gender influence motivation that is generated in the student by using VR for the study of biology in secondary school?

1.2 Research Hypothesis

The following research hypotheses will be tested at a 0.05 level of significance;

Ho_1: There is no significant difference in motivation that is generated in the student by using VR for the study of biology in secondary school based on gender

2. Materials and Methods

This study employs a survey research type**.** The selection of the sample involves purposive sampling, where twenty secondary schools are randomly selected from a total of 245 in Ilorin, Kwara State. The sample includes 544 biology students, with a gender distribution of 251 males and 293 females. The research employs the Instructional Materials Motivation Survey

(IMMS), developed by Keller (2010), as the instrument for data collection. This survey aligns with Keller's ARCS motivation model and consists of 36 questions assessing four motivational aspects: relevance, satisfaction, confidence, and attention. The survey instrument is designed with a Likert-type structure featuring five response options. Prior to data collection, the instrument undergoes evaluation by a specialist to ensure alignment with the study's goals and enhance the research's validity. Descriptive statistics, such as mean and standard deviation, are utilized to summarize and describe the main characteristics of the data. Inferential analytics, like a t-test with a significance level of 0.05. This study adheres to ethical considerations, including obtaining informed consent, ensuring participant confidentiality, and employing secure data handling.

3. Results

Table 1 present about representation of the responded, there were 251 (46%) male and 293 (54) female and the total responded were 544 in the collision of virtual reality based instruction on biology students' motivation in secondary school in Ilorin, Kwara state.

Attention is the first dimension examined. In the questions, students are asked to rate the materials' level of interest as well as whether or not the information is visually appealing, well-written, well-organized, capable of sparking students' curiosity, surprising them during class, and filled with a variety of images to keep them from getting bored. Figure 1 demonstrates that 76% of the respondents were positive, 4% were neutral, and 20% were negative.

The second dimension is relevancy, and the questions focus on how the virtual reality visuals connect to the course material and everyday life. In other words, they gauge how students will see the future applications of the materials they have used and the knowledge they have gained. As seen in Figure 2, 61% of the comments were positive regarding relevance, 19% were neutral, and 20% were negative.

The confidence dimension is oriented to questions about the ease students felt when interacting with the application, its usefulness in answering the questions of the activity, and whether they felt confident to solve a test successfully. Seventy percent (70%) of respondents in the confident dimension gave a positive response, 16% gave a response without stating their position, and 14% chose a negative response. Figure 3 presents the findings.

In the satisfaction dimension, the questions concentrate on the students' attitudes about engaging in more of these activities as well as their perceived feelings of achievement and satisfaction when interacting with virtual reality. As can be seen in Figure 4, there were 71% positive replies, 11% neutral responses, and 18% negative responses. Of the four dimensions examined, contentment received the lowest negative score.

Figure 5 shows the gender influence motivation that is generated in the student by using VR for the study of biology in secondary school. When descriptive and inferential

statistical analyses were conducted based on the findings and the student demographic information to see whether there was a gender difference in the responds.

Item E of the possibilities, which corresponds to "very true," has the greatest positive reaction for each of the four dimensions; item A, which corresponds to "not true," has the most negative response. The percentages of questions with no response or questions with two or more alternatives were included in the findings for each dimension's presentation. These answers show up in the graphs as "unanswered" in both situations. The percentages shown in the graphs are rounded, with greater values being rounded to the next higher integer and lower values to the next lower integer starting at 0.5 Attention

A total of 293 female students and 251 male students responded to the twelve questions that assessed the attentional component. Figure 5 displays the attention dimension data broken down by gender. There was a four percentage point difference in the number of male and female students who picked the highly unfavorable answer, with 22% of male students and 18% of female students choosing it. Conversely, 74% of the male students and 78% of the female students selected a very favorable reaction. There is a four percentage point difference in the values of the two groups, with the values of the female students being higher. For this dimension, the neutral answer was 4% among male students and 4% among female students.

Relevance

Two hundred and fifty-three female students and twenty-five male students responded to the nine questions on the attention dimension. Twenty four percent (24%) male students were negative, 18% were neutral in their response while 16% female were negative and neutral in their responses respectively. Fifty eight percent (58%) male were positive compared to female students' 64%, a difference of 6 percentage points that indicates that male students were more negative than female students.

Confidence

Two hundred and fifty-three female students and twenty-five male students responded to the nine questions on the attention dimension. Male students picked the highly negative response at a rate of 13% compared to female students' 15%, a difference of 2 percentage points that indicates that male students were more negative than female students. Conversely, 65% of the male students and 75% of the female students selected a very favorable reaction. The values of the two groups varied by ten percentage points, with the values of the female students being higher. For this dimension, the male and female students' neutral responses were 22% and 10%, respectively.

Satisfaction

Six questions were utilized in the satisfaction dimension, and 293 female students and 251 male students responded. The answers are displayed in Figure 8. There was a four percentage point difference in the number of male and female students who picked the highly

unfavorable reaction, with 16% of male students and 20% of female students choosing it. Conversely, 74% of the male students and 75% of the female students selected a very favorable reaction. The values of the two groups varied by one percentage point, with the values of the female students being higher.

Hypotheses Testing

Table 2 presents about student's t-test results by gender, the mean attention for female students was 5.19, with a standard deviation of 0.68, when comparing the two populations. Conversely, the mean for the male students was 3.11, with a 0.76 standard deviation. The Student's t-test yielded a p-value of 0.01 in this dimension at a 95% confidence level, or $\alpha = 0.05$. It is confirmed by this figure that the population responses differ from one another. For the relevance dimension, the mean for female students was 3.26 with a 0.66 standard deviation, while the mean for male students was 3.37 with a 0.73 standard deviation. At a 95% confidence level, or $\alpha = 0.05$, the p-value was 0.17. If this result is obtained, then it may be concluded that there is no difference in the population responses.

The confidence dimension showed that the mean for female students was 3.17 with a standard deviation of 0.69, while the mean for male students was 3.91 with the same standard deviation. There appears to be no difference between the populations, as indicated by the p-value of 0.33.

In conclusion, the mean score for female students in the satisfaction dimension was 4.17, with a standard deviation of 0.71, while the mean score for male students was 3.73, with a standard deviation of 0.87. The p-value in this instance was 0.41, indicating no variation between the populations under investigation.

4. Discussion

The findings show that females had much higher levels of attentiveness than males. However, both genders respond positively to this dimension. This may be due to that when it is in use students might therefore get better performance in this dimension with increased use. This is in agreement with the study of Mouronte-López (2021) observed the analyzing the gender influence on the interest in engineering and technical subjects and the result indicated that both male and female students were interested in the things being studied in virtual reality. Felnhofer et al. (2012) reported that women and men may differ in the way they experience virtual environment. Men reported a higher sense of spatial presence, more perceived realism, and higher levels of the sense of actually being in the environment than women. Outlaw and Deckles(2017) reported that virtual settings tend to lack activities that women tend to be of

interest, women are more than twice as likely as men to feel unwell from using virtual Reality, with symptoms such as pallor, sweating, increased heartrate, drowsiness, disorientation and general discomfort (Al Zayer et al., 2019; Munafo et al., 2017).

5. Conclusion

Virtual Reality is a powerful tool for not only fostering emotional satisfaction but also for promoting engagement within the learning process. Moreover, implementation of virtual reality-based instruction collision on the motivation of biology students in secondary schools located in Ilorin, Kwara state will be significant and the study goes beyond just exploring the overall benefits of VR and delves into the nuanced differences that exist based on gender. In addition, the findings ascertained that female students tend to exhibit a more pronounced positive response in the attention dimension when compared to the male students. However, it is crucial to note that both genders generally exhibit positive responses across the different motivational dimensions, thereby highlighting the inclusive and equitable nature of VR-based instruction.

6. Conflict of Interest

We certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

7. Reference

Al Zayer, M., Adhanom, I. B., McNeilage, P., & Folmer, E. (2019). *The effect of field-of-view restriction on sex bias in VR sickness and spatial navigation performance*. Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems.

Bower, M., Howe, C., McCredie, N., Robinson, A., & Grover, D. (2014). Augmented reality in education—cases, places and potentials. *Educational Media International, 51*(1), 1–15. https://doi.org/10.1080/09523987.2014.889400.

Cao, L., Lin, J., & Li, N. A. (2019). Virtual reality simulation method for crowd evacuation in a multiexit indoor fire environment. *Computers in Human Behavior, 90*, 37–45.

Chiang, T. H. (2021). *Investigating effects of interactive virtual reality games and gender on immersion, empathy and behavior into environmental Education.* Frontiers in Psychology, 12, 608407. https://doi.org/10.3389/fpsyg.608407

Choi, D. H., Dailey-Hebert, A., & Estes, J. S. (Eds.). (2016). *Emerging tools and applications of virtual reality in education*. Information Science Reference. https://doi.org/10.4018/978-1-4666-9837-6.

Christopoulos, A., Conrad, M., & Shukla, M. (2018). Increasing student engagement through virtual interactions: how? *Virtual Reality, 22*, 353–369.

Clarke, M. J., Marks, A. D., & Lykins, A. D. (2016). Bridging the gap: the effect of gender normativity on differences in empathy and emotional intelligence. *Journal of Gender Studies, 25*, 522–539. https://doi.org/10.1080/09589236.2015.1049246

Dick, E. V. (2021). *The promise of immersive learning*. Information Technology and Innovation Foundation, United States.

Felnhofer, A., Kothgassner, O. D., Beutl, L., Hlavacs, H., & Kryspin-Exner, I. (2012). *Is virtual reality made for men only? Exploring gender differences in the sense of presence*. Annual Conference of the International Society on Presence Research.

Flores, J., Camarena, P., & Avalos, E. (2014). Virtual reality, an innovative technology

applicable to the teaching process of engineering students. *Apertura*, *6*, 1–13.

Garduño, H. S., Martínez, M. E., & Castro, M. P. (2021). Impact of virtual reality on student motivation in a high school science course. *Applied Sciences*, *11*, 9516.

Guo, Y., Zhu, J., Wang, Y., Chai, J., Li, W., Fu, L., Xu, B., & Gong, Y. A. (2020). Virtual reality simulation method for crowd evacuation in a Multiexit Indoor Fire Environment. *ISPRS International Journal of Geo-Information*, *9*, 750.

Hedrick, E., Harper, M., Oliver, E., & Hatch, D. (2022, May). Teaching & learning in virtual reality: Metaverse classroom exploration. *Proceedings of the 2022 Intermountain Engineering, Technology and Computing (IETC)*, Orem, UT, USA (pp. 1–5). IEEE. https://doi.org/10

Huang, K.-T., Ball, C., Francis, J., & Ratan, R. A. (2019). Augmented versus virtual reality in education: an exploratory study examining science knowledge retention when using augmented reality/virtual reality mobile applications. *Cyberpsychology, Behavior, and Social Networking*, *22*, 105–110.

Keller, J. M. (2010). *Motivational design for learning and performance: The ARCS Model Approach;* Springer US: Berlin/Heidelberg, Germany.

Keller, J. M. (2010). *Motivational design for learning and performance: The ARCS Model Approach.* Springer.

Li, X., Yi, W., Chi, H. L., Wang, X., & Chan, A. P. (2018). A critical review of virtual and augmented reality (VR/AR) applications in construction safety. *Automation in Construction*, *86*, 150–162.

Mareta, S., Thenara, J. M., Rivero, R., & Tan-Mullins, M. (2022). A study of the virtual reality cybersickness impacts and improvement strategy towards the overall undergraduate students' virtual learning experience. *Interactive Technology & Smart Education*, *19*(4), 460–481. https://doi.org/10.1108/ITSE-10-2021-0193

Martín-Gutiérrez, J., Mora, C. E., Añorbe-Díaz, B., & González-Marrero, A. (2017). Virtual technologies trends in education. *Eurasia Journal of Mathematics, Science and Technology Education*, *13*, 469–486.

Mills, R. (2004). Kids CollegeTM: An implementation of the ARCS model of motivational design. http://www.contentedits.com/img.asp?id=1706 (accessed on 9 September 2021).

Milman, N. B. (2018). Defining and conceptualizing mixed reality, augmented reality, and virtual reality. *Distance Learning*, *15*, 55–58.

Morimoto, J., & Ponton, F. (2021). Virtual reality in biology: could we become virtual naturalists? *Evolution: Education and Outreach*, *14*, 1–13.

Mouronte-López, M. L., García, A., Bautista, S., & Cortés, C. (2021). Analyzing the gender influence on the interest in engineering and technical subjects. *International Journal of Technology and Design Education*, *31*, 723–739.

Munafo, J., Diedrick, M., & Stoffregen, T. A. (2017). The virtual reality head-mounted display Oculus Rift induces motion sickness and is sexist in its effects. *Experimental Brain Research*, *235*(3), 889–901.

Naranjo, M. (2009). Motivation: Theoretical perspectives and some considerations of its importance in the educational environment. *Revista de Educación*, *33*, 153–170.

Nowak, M. (2020). What is augmented reality? your guide to immersive technologies. Retrieved from https://www.nomtek.com/blog/what-is-augmented-reality.

Outlaw, J., & Duckles, B. (2017). *Why women don't like social, virtual reality: a study of safety, usability and self-expression in social VR.*

Parong, J., & Mayer, R. E. (2018). Learning science in immersive virtual reality. *Journal of Educational Psychology*, *110*, 785–797.

Pellas, N., Mystakidis, S., & Kazanidis, I. (2021). Immersive virtual reality in K-12 and higher education: a systematic review of the last decade scientific literature. *Virtual Reality*, *25*, 835–861.

Qushem, U. B., Christopoulos, A., Oyelere, S. S., Ogata, H., & Laakso, M. J. (2021).

Multimodal technologies in precision education: providing new opportunities or adding more challenges? *Education Sciences, 11*(338).

Reinke, N. B., Kynn, M., & Parkinson, A. L. (2021). Immersive 3D experience of osmosis improves learning outcomes of first-year cell biology students. *CBE—Life Sciences Education, 20*(1). doi: 10.1187/cbe.19-11-0254.

Sari, I., & Sinaga, P. (2020). *The impact of industrial revolution 4. In 0 on basic chemistry learning.* In Proceedings of the 2nd Science And Mathematics International Conference (SMIC 2020): Transforming Research and Education of Science and Mathematics in the Digital Age, Jakarta, Indonesia.

Shibata, T. (2019). Virtual reality in education: How schools use VR in classrooms. In S. Bagnara, R. Tartaglia, S. Albolino, T. Alexander, & Y. Fujita (Eds.), *Proceedings of the 20th Congress of the International Ergonomics Association (IEA 2018)* (Vol. 827, Advances in Intelligent Systems and Computing, pp. 460–481). Springer. https://doi.org/10.1007/978-3-319-96059-3_48

Shibata, T., Drago, E., Araki, T., & Horita, T. (2018, June). Encouraging collaborative learning in classrooms using virtual reality techniques. In T., Bastiaens, J. V., Braak, M., Brown, L., Cantoni, M., Castro, R., Christensen, G. V., Davidson-Shivers, K., DePryck, M., Ebner, M., Fominykh, C., Fulford, S., Hatzipanagos, G., Knezek, K., Kreijns, G., Marks, E., Sointu, E. K., Sorensen, J., Viteli, J., Voogt, … O., Zawacki-Richter (Eds.), *EdMedia+ innovate learning* (pp. 1577–1582). Association for the Advancement of Computing in Education (AACE).

Sparks, S. (2013). Students gender study and academics differences. *Academic Journal, 2*(2 & 3), 48–60.

Tamayo, J. L. R., Hernández, B. M., & Gómez, H. G. (2018). Digital data visualization with interactive and virtual reality tools. Review of current state of the art and proposal of a model. *ICONO 14. Revista de Comunicación y Tecnologías Emergentes, 16,* 40–65.

Tchaikovsky, D. S., & Izotova, V. F. (2020). The impact of AR and VR technologies on the educational process. *Information Technologies and Learning Tools, 3,* 316–319.

Torres, J. (2021). *Motivational design ARCS (Attention, Relevance, Confidence, and Satisfaction).* https://www.academia.edu/6516253/Dise%C3%B1o_Motivacional_ARCS_Atenci%C3%B3n_Relevancia_Confianza_y_Satisfacci%C3%B3n.

Udoh, N. M., & Ekon, E. E. (2018). Influence of virtual reality and flow chart on biology students' academic achievement on circulatory system in Uyo municipality, Akwa Ibom State, Nigeria. *Journal of Education and Practice, 9*(12).

Won, J.-H., & Kim, Y. (2021). A Study on Visually Induced VR Reduction Method for Virtual Reality Sickness. *Applied Sciences, 11,* 6339.

Wu, B., Yu, X., & Gu, X. (2020). Effectiveness of immersive virtual reality using head-mounted displays on learning performance: A meta-analysis. *British Journal of Educational Technology, 51,* 1991–2005.

Yang, L. I., Huang, J., Feng, T. I., Hong-An, W. A., & Guo-Zhong, D. A. (2019). Gesture interaction in virtual reality. *Virtual Reality & Intelligent Hardware, 1,* 84–112.

Table1: *Demographic representation of the responded*

S/N	Gender	Number of responded	Percentage
1	MALE	*251*	*46%*
2	FEMALE	*293*	*54%*
Total		*544*	*100%*

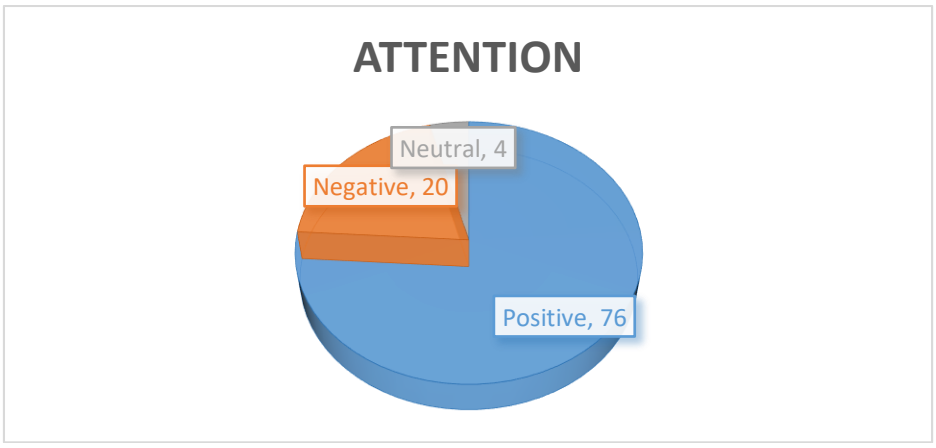

Figure 1. Graph of the average response to the attention dimension questions.

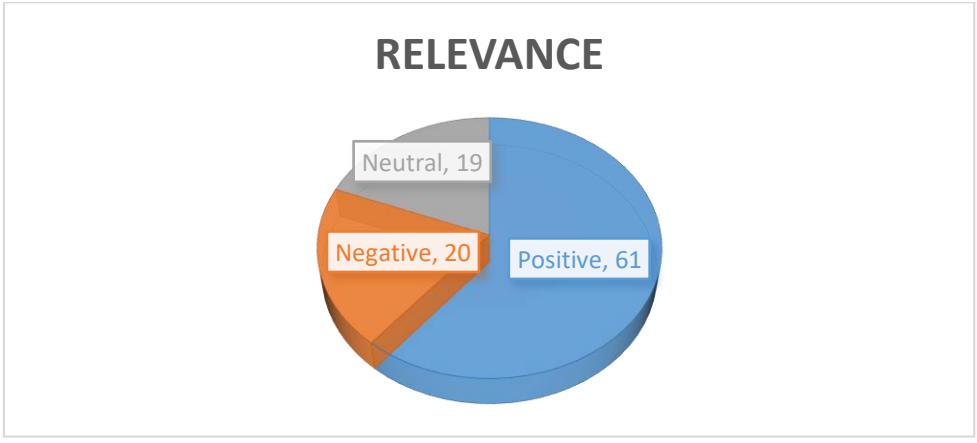

Figure 2. Graph of the average response to the relevance dimension questions

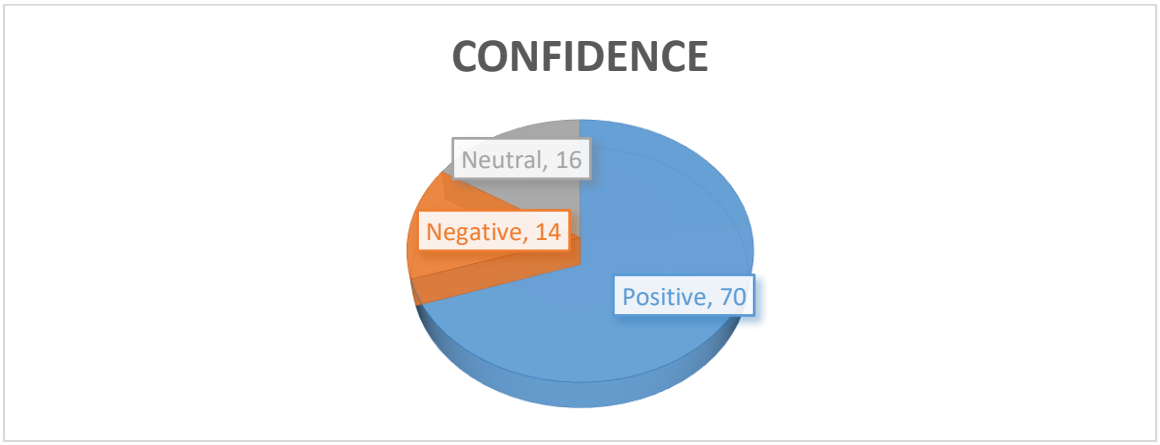

Figure 3. Graph of the average response to the confidence dimension questions

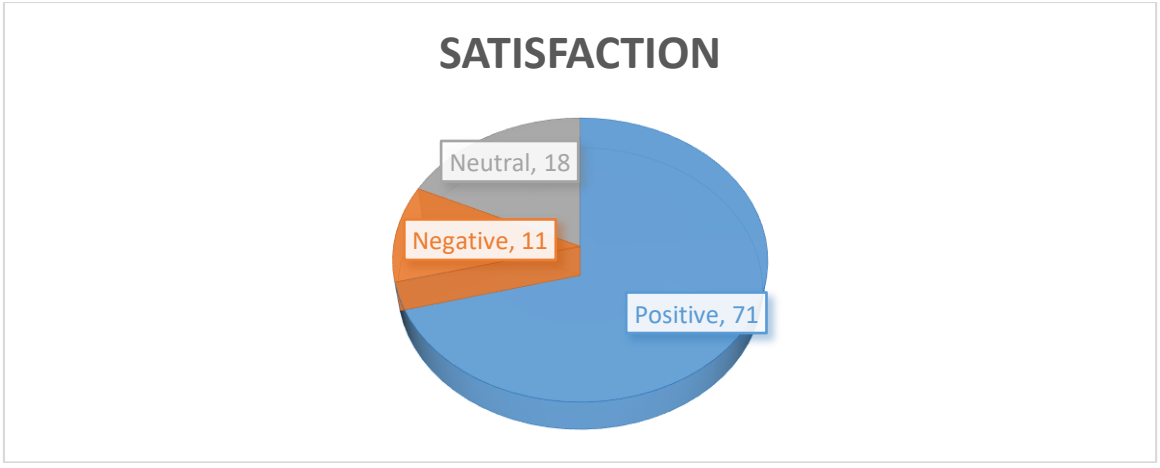

Figure 4. Graph of the average response to the satisfaction dimension questions.

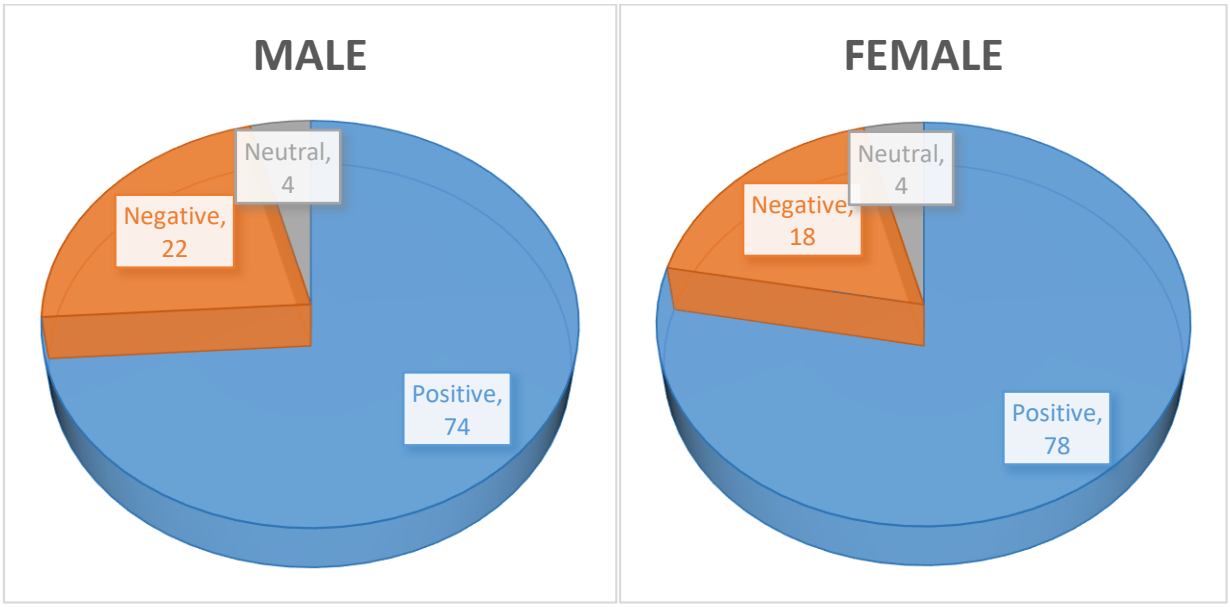

Figure 5. Results of the attention dimension by gender.

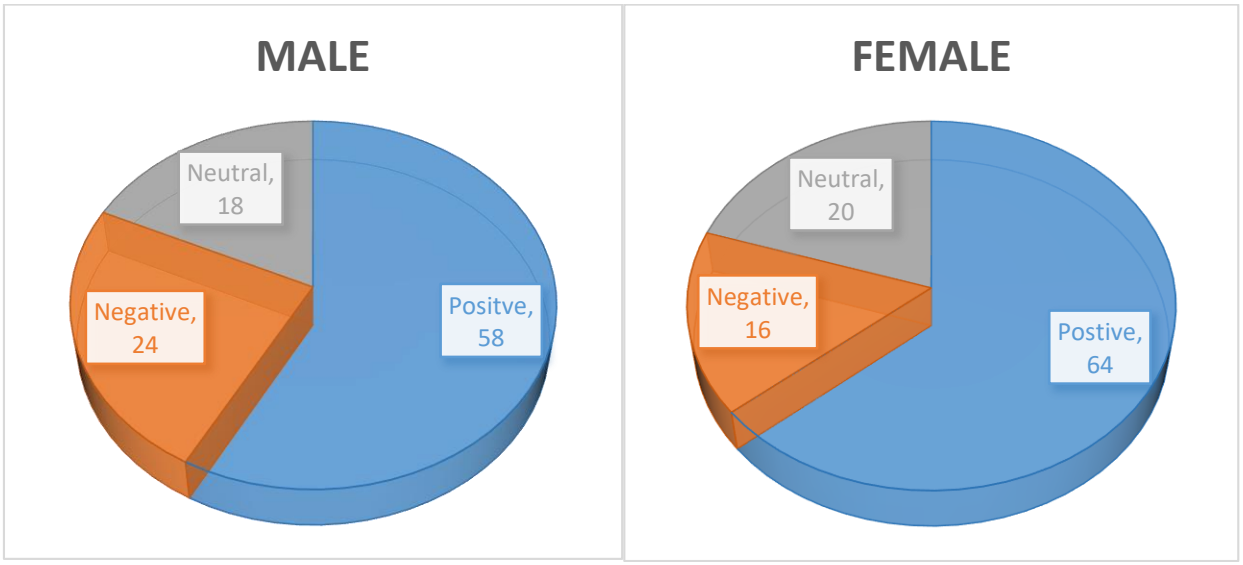

Figure 6. Results of the relevance dimension by gender.

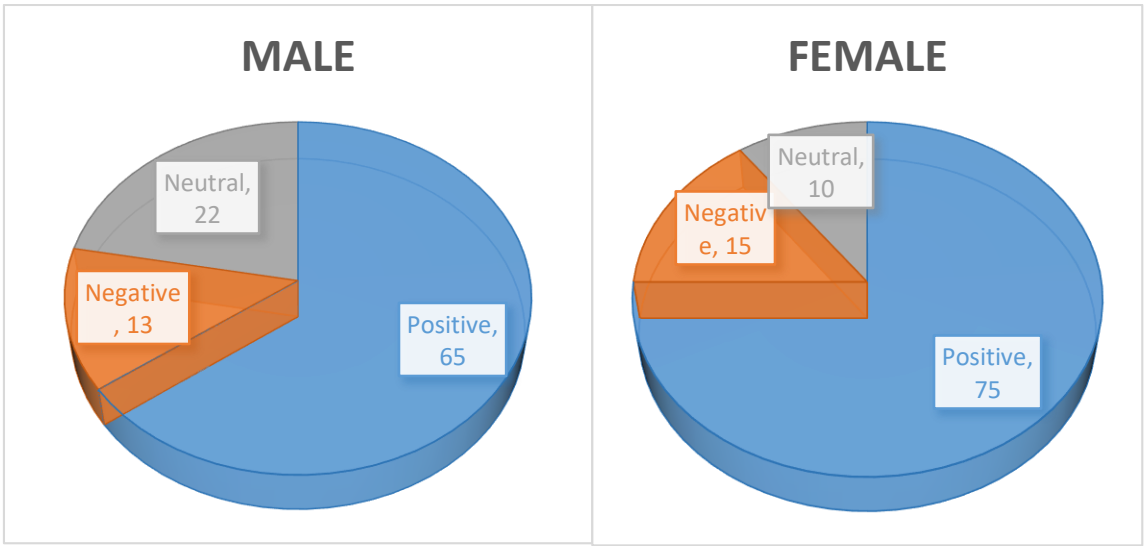

Figure 7. Results of the confidence dimension by gender.

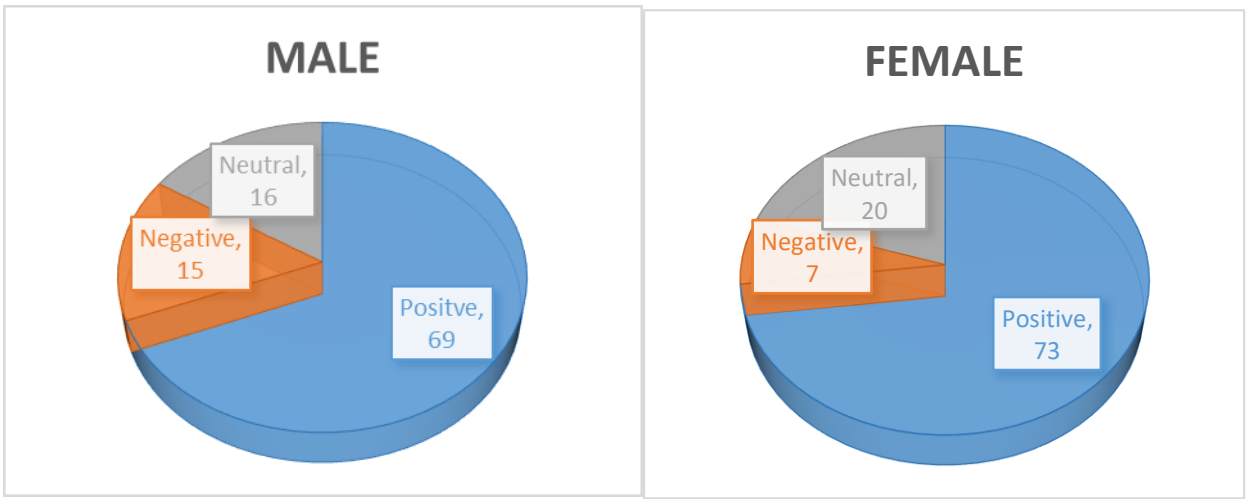

Figure 8. Satisfaction dimension responses by gender.

Table 2:

Table of Student's t-test results by gender

	Female (*n* = 293) M(DE)	**Male (*n* = 251) M(DE)**	**t**	***P***
Attention	5.19(0.68)	3.11(0.76)	2.71	0.01
Relevance	3.26(0.66)	3.37(0.73)	1.49	0.17
Confidence	3.17(0.69)	3.91(0.69)	−0.81	0.33
Satisfaction	4.17(0.71)	3.73(0.87)	1.11	0.41