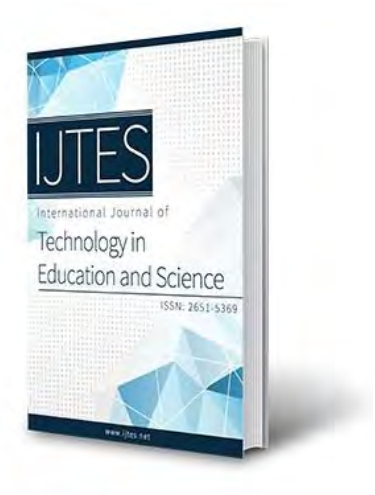

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Development of 5 Cs Educational Value Scale for eSport Games

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Abstract

With the growing popularity of eSport games, eSport-related issues have gradually gained attention and discussion in academic research. However, the positive benefits (values) brought by playing eSport have not received too much attention in current research. Therefore, after reviewing related research in the past, this study proposed that eSport has the 5 Cs educational Value of cultivating the cooperative attitude, communication skills, critical thinking, self-confidence and continuous improvement attitude based on the three-domain model (TDM) of cognitive, affective and psychomotor, and developed an eSport educational values scale. In this study, a conceptual sampling method was adopted and players with eSport experience were invited to fill out the questionnaire. A total of 316 participants filled out the questionnaire, 51 invalid samples were deleted, the number of effective participants was 265, and the effective recovery rate was 83.9%. Then SPSS 23.0 and AMOS 20.0 were used to analyze the reliability and validity of the scale, and the verification results show the scale developed by this study has good reliability and validity. In addition, in this study, it was also found that the participants had a positive view ($M > 3.9$) on the 5 Cs educational value of the MOBA type eSport, which shows that eSport is not only a casual game, moderate playing this game can also bring educational significance to players.

Introduction

eSport is regarded as a new research field of sports management, education and practice (Funk, 2017; Funk et al., 2018), and is defined as a physical activity in which people use information and communication technology development to train their intellectual or physical abilities (Wagner, 2006; Wood et al., 2019). eSport is a kind of game associated with training sports knowledge, game skills, social interaction and problem-solving skills (Baltezarević & Baltezarević, 2019; Egliston, 2016; Kauweloa & Winter, 2019; Sousa et al., 2020). In addition, eSport also includes training, reflex, intelligence, teamwork and other elements (Arnaud, 2010). Therefore, eSport players must continuously improve their skills to maximize the display of their abilities in the game. At the same time, eSport also helps build a foundation of trust for the team, promotes a sense of mutual respect, allows players to establish social interactions with other eSport players and develop personal friendships, thereby increasing their social identity of the activity, and getting better results through competition (Seo, 2016). Therefore, eSport has the characteristics of allowing team members to share work tasks, follow the behavior of others, and cultivate and contribute their own abilities, while these behaviors are considered to be helpful for the

team to accomplish complex game tasks (Mathieu et al., 2000). It can be seen from the above that eSport should have the characteristics of teamwork, skill training, and thinking training, and it is also in line with what was mentioned by Sukmanasa et al. (2019) that the interaction between people and the environment will have a learning effect.

Multiplayer online battle arena games (MOBA) eSport is a large-scale virtual environment that requires complex problem solving and social interaction (Kokkinakis et al., 2016). The ability of team members performing team management tasks (such as solving conflict, coordination, communication and cooperation) has a profound impact on the team's results (Salas et al., 2015). At the same time, one of the most unique aspects of MOBA games is the so-called metagame, and understanding is crucial to the achievement of game tasks (Mora-Cantallops & Sicilia, 2018).

However, as far as the current research on eSport is concerned, learning seems to be an immature research field. There are only a few relevant researches at present, and few current education researches tries to study the educational values brought by MOBA type eSport. Therefore, this study aims to explore the meaning or values of education in eSport and understand the thoughts on these educational values.

The emphasis of learning and evaluation in the 21st century is not limited to the basic knowledge of reading, writing, interpretation and synthesis. Instead, the focus is on cognitive skills, interpersonal skills and technical skills (Ananiadou & Claro, 2009; Geisinger, 2016). As seen from the three-domain model (TDM) (Bloom, 1956; Hoque, 2016), the abilities that need to be learned in the 21st century correspond to cognitive, affective, psychomotor and other learning fields. As shown in the above literature, TDM can help determine the education elements in eSport. Therefore, this study used TDM to construct eSport's 5 Cs educational value scale and understand the game players‘ perception of values brought by such eSport.

Method

Research Process

In this study, the online questionnaire was distributed in a convenient sampling method. The questionnaire collection time was from February 15 to March 31, 2020. The questionnaire was distributed to the players who have played the King of Glory game for a long time in China. The number of questionnaires returned was 316.

Research Subjects

The number of participants in this study (the number of questionnaires returned) was 316, and a total of 51 invalid data were deleted. There were 265 valid study participants, and the effective recovery rate was 83.9%, including 138 males (52.1%) and 127 females (47.9%); 174 students (65.7%) and 91 participants (34.3%) who were not students; 72 participants (27.1%) with the game experience of less than 6 months, 47 participants (17.7%) with the game experience of 6 months to 1 year, 44 participants (16.6%) with the game experience of 1 to 1.5 years, 39 participants (14.7%) with the game experience of 1.5 to 2 years, and 63 participants (23.8%)

with the game experience of more than 2 years.

Measurement Tools

The content of this research scale was developed from previous research and related theories, and was reviewed by 3 quantitative research scholars engaged in social science research. The expert review was divided into 3 rounds. The first round of review focused on the review of the design suitability and completeness of the dimensions and the items, and revisions were proposed; the second round was to review the legibility of the revised items and propose revisions; the third round focused on the text fluency of the revised items and advice on revisions was made. Finally, 5 players with more than 1 year of eSport experience were invited to fill in the scale for trial. The content of the scale was based on the Likert 5-point scale, ranging from 1 (strongly disagree) to 5 (strongly agree). After the questionnaires were collected, AMOS 20.0 was used to conduct a first-order confirmatory analysis with the decision value as the criterion for deleting the items, and then SPSS 23.0 was used to analyze the reliability and validity. The description of the relevant dimensions and the content of the items are as follows:

Questionnaire Preparation

Cooperative Attitude

Cooperative attitude refers to whether participants want to work together with team members to complete the ideas of the designated scientific subject in the competition (Hong et al., 2020). When cooperation becomes the normal, there will be a cooperative attitude within the organization, and a good cooperative attitude is helpful to ensure that groups within the organization focus on the same or very similar things (Hall et al., 2012; Mendo-Lázaro et al., 2017).

MOBA type eSport is a game that requires high-level teamwork (Eaton & Mendonça, 2019; Mora-Cantallops & Sicilia, 2018; Sapienza et al., 2018). Teamwork in eSport is located in a extremely competitive virtual environment. Its successful performance relies on tacit cooperation and rapid team decision-making (Freeman & Wohn, 2019; Hong et al., in press). Therefore, game players need to have a good cooperative attitude to have the opportunity to present a high level of team tacit and cooperative style. In this study, the cooperative attitude means that after playing eSport, players know how to get along with team members and be considerate towards others, shown in Table 1.

Table 1. Content of Cooperation Attitude Dimension

Code	Content
CA1	I think I understand the importance of teamwork effectiveness better after playing eSport.
CA2	I think playing eSport makes me more considerate of others' mistakes.
CA3	I feel playing eSport can cultivate my willingness to help others.
CA4	I think I understand better that I should be considerate to my team partners after playing eSport.
CA5	I think playing eSport can make my interpersonal relationship better.

Communication Skills

The importance of communication skills is recognized by both academia and industry. Insufficient communication skills and poor communication efficiency will seriously affect individuals and professionalism (Riemer, 2007). Interpersonal skills in the communication process require people to have the ability to transmit information, listen and provide feedback (Kay & Greenhill, 2011; Robbins & Hunsaker, 2003). It is recorded in previous research that gamification can be used to teach communication skills, including the development of oral communication skills to interpersonal communication skills (Bodnar & Clark, 2017). eSport is believed to help develop social, communication and other skills (Garcia-Naveira et al., 2018; Seo, 2013). In this study, communication skills refer to that players have a better understanding of how to have a friendly or benign team communication after playing eSport, they will not speak bad words because of disputes, they will think about whether the content is appropriate before speaking, and know how to listen to or respect team members' words, shown in Table 2.

Table 2. Content of Communication Skills Dimension

Code	Content
CSG 1	I think playing eSport makes me know better how to respect the ideas of my teammates.
CSG 2	I think that after playing eSport, I have a better understanding of how to communicate with others.
CSG 3	I think that after playing eSport, I understand better that I should not directly deny the comments of my teammates.
CSG 4	I think that after playing eSport, I understand better that I can make suggestions instead of blame.
CSG 5	I think that after playing eSport, I know more about speaking for the proper occasion.

Critical Thinking

Critical thinking is considered to be the process of conceptualizing, analyzing or synthesizing, evaluating and applying information to solve problems, determine action plans, find answers to given problems or draw conclusions (Kay & Greenhill, 2011; Shavelson et al., 2019). From the perspective of rational components, critical thinking is a set of advanced thinking skills that can be improved and transferred, including analysis, reasoning, deduction and inductive reasoning, while the emotional component refers to the tendency towards thinking (D'Alessio et al., 2019). Proponents of critical thinking believe that our future depends on our ability to think critically in an increasingly complex world (Halpern & Butler, 2019).

Critical thinking involves different skills that cover questioning the source of knowledge, testing the validity of the information obtained, analyzing its reliability and making appropriate explanations targeting specific tasks or situations (Bruine et al., 2007; Brookhart, 2010; Halpern, 2014; Hong & Choi, 2015). In eSport, critical thinking helps players develop good game strategies and problem-solving skills. For example, Seo (2013) pointed out that eSport helps develop the capacity for decision-making and problem-solving skills, so it requires clear eSport player strategies and tactics to surpass opponents or teams (Hallmann & Giel 2018), and these need to be based on critical thinking. In this study, critical thinking refers to that after playing eSport, players know

how to formulate different strategies through systematic, logical and covariance methods to respond to possible game conditions, shown in Table 3.

Table 3. Content of Critical Thinking Dimension

Code	Content
CT1	I think that after playing eSport, I have a better understanding of how to deduce different strategies for breaking through according to different situations.
CT 2	I think that after playing eSport, I have a better understanding of how to formulate strategies based on the strengths of different teammates.
CT 3	I think that after playing eSport, I have a better understanding of how to propose contingency strategies for emergencies. (continued)
CT 4	I think that after playing eSport, I have a better understanding of how to respond to the game situation by analogy.
CT 5	I think that after playing eSport, I know how to develop offensive and defensive strategies.

Self-Confidence

Self-confidence involves self-awareness or personal assurance of one‘s skills, talent, ability, judgment, capacity and quality (Ancarani et al., 2020; Hughes et al., 2019; Stankov et al., 2012). Only oneself can define and determine one‘s self-confidence (Geoffrion et al., 2013; Jiang & Kleitman, 2015). Confidence refers to the subjective metacognitive experience resulting from a person‘s deterministic judgment of his or her performance (Jiang & Kleitman, 2015). Garcia-Naveira et al. (2018), Ingram and Cangemi (2019) found that routine exercises of video games and eSport stimulate specific brain structures and have a positive impact on mental skills, such as self-confidence. In this study, self-confidence refers to the fact that after playing eSport, players have better self-confidence in interacting with others or their performance, shown in Table 4.

Table 4. Content of Self-confidence Dimension

Code	Content
C1	I think playing eSport makes me more confident when interacting with people.
C2	I think playing eSport makes me more confident in my ability and performance.
C3	I think playing eSport makes me more confident in my ability to react.
C4	I think playing eSport makes me more confident in my strategic ability.
C5	I think playing eSport makes me more confident in my teamwork ability.

Continuous Improvement Attitude

continuous improvement attitude is a common method that represents an organization's continuous efforts to explore and apply new methods to improve operations (Anand et al., 2009; Bessant et al., 1994). There is no unique and accepted definition of the concept of continuous improvement attitude, but continuous improvement

attitude can be defined as a process of continuous improvement attitude (Sánchez-Ruiz et al., 2019). The game allows players to participate in the formulation, experimentation, interpretation and adjustment of game strategies to solve problems, so that players can practice persistent problem-solving methods (Kiili, 2007), which is regarded by this study as an attitude of continuous improvement attitude. And in this study, the continuous improvement attitude means that after playing eSport, players know more about continuous enhancement and improvement of their abilities, and getting rid of their shortcomings, shown in Table 5.

Table 5. Content of Continuous Improvement Attitude Dimension

Code	Content
CI1	I think that after playing eSport, I will continue to improve the strategy of toppling towers.
CI2	I think that after playing eSport, I will continue to improve the skill of operating the game characters.
CI3	I think that after playing eSport, I will continue to improve the parts that are easy to make mistakes.
CI4	I think after playing eSport, I will continue to practice new character roles.
CI5	I think after playing eSport, I will continue to improve the way I collaborate with my teammates.

Item Analysis

The first-order confirmatory factor analysis was adopted for item analysis of this study. Relevant scholars suggest that the value of $\chi 2/df$ should be less than 5; RMSEA should be less than 0.1; GFI and AGFI should be higher than 0.8; items with the factor loading (FL) less than.50 should be deleted from the original questionnaire (Hair et al., 2010; Kenny et al., 2015). For the dimension of communication skills, 5 items were reduced to 4; for critical thinking, 5 items were reduced to 4; for continuous improvement attitude, 5 items were reduced to 4, shown in Table 6.

Table 6. First-order Confirmatory Analysis

Index	$\chi 2$	df.	$\chi 2$/df.	RMSEA	GFI	AGFI
Threshold	---	---	< 5	<.1	>.8	>.8
Cooperative attitude	11.3	5	2.26	.069	.984	.951
Communication skills	1.2	2	.6	.000	.998	.989
Critical thinking	4.8	2	2.4	.072	.991	.956
Self-confidence	10.6	5	2.12	.065	.985	.956
Continuous improvement attitude	2.4	2	1.2	.026	.996	.978

Results

Reliability Analysis

In this study, Cronbach's α was used to confirm the internal consistency of the test scale. Hair et al. (2010) suggested Cronbach's α higher than.7 as the acceptable standard, while the values of Cronbach's α in this study were between.760 and.802, which met the recommended standard, shown in Table 7.

Table 7. Reliability Analysis

Construct	Items	M	SD	α
Cooperative attitude	5	4.022	.646	.783
Communication skills	4	4.248	.563	.760
Critical thinking	4	4.173	.644	.802
Self-confidence	5	3.978	.679	.780
Continuous improvement attitude	4	3.910	.767	.774

Validity Analysis

Hair et al. (2010) pointed out that the FL value of each dimension item should not be less than.50 to have convergence validity, so this study used.50 as the test standard. All items retained in this study met the standards recommended by scholars, among which the FL values of cooperative attitude were between.603 and.687, the FL values of communication skills were between.638 and.699, and the FL values of critical thinking were between.663 and.757, the FL value of self-confidence were between.606 and.702, and the FL values of the continuous improvement attitude were between.628 and.743, shown in table 8.

This study used the external validity of the items to determine the explanation scope of the study (Cor, 2016). The first 27% and the last 27% of the values of all respondents for each item were taken for the t test; if the t value was greater than 3 (***p <.001), it was considered that the external validity has reached a significant level. Table 8 shows that the t values of cooperative attitude ranged from 10.668 to 12.667, the t values of communication skills ranged from 12.889 to 15.567, and the t values of critical thinking ranged from 13.902 to 16.292, the t values of self-confidence ranged from 13.346 to 14.979, and the t values of continuous improvement attitude ranged from 11.934 to 15.428, which means that all the items in this study have discrimination (Green & Salkind, 2004), shown in Table 8.

Table 8. Validity Analysis

Item	FL	t	Item	FL	t
CAGV1	.603	10.668	CTGV4	.735	13.902
CAGV2	.652	12.607	CTGV5	.689	16.292
CAGV3	.661	15.042	CGV1	.702	14.979
CAGV4	.687	14.376	CGV2	.606	13.346
CAGV5	.638	12.667	CGV3	.676	14.718
CSGV1	.699	15.567	CGV4	.633	14.006
CSGV3	.638	13.914	CGV5	.606	14.166
CSGV4	.666	15.164	CIGV2	.743	15.428
CSGV5	.660	12.887	CIGV3	.628	13.334
CTGV2	.663	14.031	CIGV4	.676	14.556
CTGV3	.757	14.435	CIGV5	.675	11.934

Discussion and Conclusion

eSport is proven to be require time to practice, which is the same as other sports activities. It is a sport involving skill building and health benefits, and eSport players have to put in a lot of effort to become a member of the best team. But this does not mean that the players only need to focus on one thing. Instead, they must also pay attention to many different skills, knowledge and network-related aspects (Happonen & Minashkina, 2019). In addition, the eSport team is a high-performance action team, with members engaged in computer-supported cooperative work (CSCW), and this combination is not common in the traditional team environment (Freeman & Wohn, 2019), so eSport has the team cooperation characteristics of online communities.

eSport is believed to help build the trust foundation of the team, promote the awareness of mutual respect among members, allow players to establish social interactions with other eSport players, and establish personal friendships, thereby increasing their sense of social identity for the activity, and getting better results through competitions (Seo, 2016), which can effectively promote teamwork and communication (Hamilton, 2019). And, the results of this study show that participants do believe that eSport helps cultivate a good cooperative attitude. In eSport, in order to obtain the best performance, players must be able to adapt to opponents, communicate with teammates and trust their teammates (Bányai et al., 2019), so eSport is considered to help develop social and communication skills (Seo, 2013), and analysis results of this study show that participants believe that eSport helps develop effective communication skills.

eSport players need to have clear strategies and tactics in order to surpass their opponents (Hallmann & Giel 2018). Baltezarević and Baltezarević (2019) pointed out that eSport-based games can provide highly adaptable and motivating methods, and can help players develop the abilities of thinking and competitiveness, social interaction, as well as cultivating problem-solving skills. Seo (2013) also suggested that eSport helps players develop decision-making and problem-solving skills. As seen from the above, eSport is a powerful tool that can help players develop complex thinking (such as critical thinking, meta-thinking). The analysis results of this study show that participants believe that eSport helps to cultivate good critical thinking. Games can promote the development of abilities including self-confidence, allowing players to have the ability to play in difficult situations or equal situations (Lemcke & Weh, 2018). In addition, Garcia-Naveira et al. (2018) found regular practice of eSport games can stimulate the player‘s specific brain structure, and have a positive impact on such mental skills as motivation, self-regulation, self-confidence and social skills. The analysis results of this study show that participants believe that eSport helps to enhance personal self-confidence.

eSport can be defined as a competitive game, where amateur players can develop strategies and reconfigure their own action patterns by watching videos of analysis actions of professional game (Taylor, 2012). Himmelstein et al. (2017) confirmed that eSport players can acquire the abilities needed in the game by setting goals, analyzing performance, practicing personal skills and maintaining a growth mentality. This shows that eSport players need to improve their personal abilities through repeated analysis and practice. The analysis results of this study show that participants believe that eSport helps to cultivate a good attitude towards continuous improvement attitude.

Recommendations

eSport has gained high attention in recent years and has been listed as an official international sports event. However, no current research has pointed out the educational values of eSport games, so this study was based on cognitive, affective and psychomotor (Bloom, 1956; Hoque, 2016), using a three-domain model (TDM) to construct an eSport 5 Cs educational value scale with reliability and validity. This study found that eSport games can help cultivate players‘ 5 Cs education values of cooperative attitude, communication skills, critical thinking, self-confidence and continuous improvement attitude. From the perspective of the TDM model, the cooperative attitude can correspond to the cognitive domain, the self-confidence can correspond to the emotional domain, and the communication skills and continuous improvement attitude can correspond to the psychomotor domain.

Although the eSport team can be composed of men and women in principle, there are still serious gender imbalances in eSport. Therefore, exploring gender-related issues in eSport can help fill up the gap in related gender research and clarify the gender imbalance argument, because eSport is a potential gender equality activity (Rosell Llorens, 2017; Schelfhout et al., in press). Therefore, it is suggested that follow-up research can explore the role of gender in eSport, such as different genders‘ preference for eSport games, and the discussion of different genders‘ play styles of eSport games.

Research in cognitive science and psychology focuses on the performance of players, as well as the cognitive and behavioral differences between novices and experts (Gobet, 2016; Reitman et al., 2020), because the discussion of the cognition and behavior of novices and experienced players can help learn the differences in behavior patterns between the two, and understand the selection factors of game behavior and strategy implementation by novices and experienced players, so as to help eSport players plan more appropriate training strategies. Therefore, it is suggested by this study that follow-up research can follow this research direction.

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