ARCS Model Applied in High School Business Gaming: Implementation And Analysis

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ABSTRACT

It presents the development, implementation and results of a Brazilian high school business tournament (TEIAR) applied in middle schools in public and private schools in the city of Rio de Janeiro according to Keller's ARCS Model. TEIAR are token place at four different meetings.

The market is make up of students playing the role of Suppliers, Manufacturers, and Retailers, competing among themselves in the same industries (either jewels or toys). The Companies are evaluating by themselves and an Audit Committee formed by one teacher at most. The number of participants at TEIAR can vary from 20 up to 30 students.

Each company pays for its raw material, produces its goods and sells its products according to the agreed-on model by the client. Their aims are:

- *Meet the end customer's expectations and needs;*
- *Coordinate the improvement actions together with its suppliers;*
- *Satisfy the social and environmental requirements;*
- *Manage their processes and human resources synergistically;*
- *Keep updated its database about the business;*
- *Provide economy and finance outcomes, including profits.*

Companies have their performance duly assessed according to an Assessment Form. Each item, 23 in total, evaluated is graded (1 to 5), which should be filled out by the Auditors Committee as well as the companies related to the respective items under their responsibilities. These assessments are based on the eight Brazilian Business Excellence Model.
A correlation matrix is presented in order to analyze the intersection of TEIAR four meetings with the ARCS Model, which indicate positive correlations (+) and negative ones (-).

INTRODUCTION

In these almost half a century of study and systematization of game and simulation activities (S&G), topics in a wide and growing range of fields of knowledge related to theory, research and field practice have been addressed in many countries, including Brazil's best papers (WOLFE & SAUAIA, 2003; CANNON, PACHECO & BERNARD, 2010; BARÇANTE, 2010). Through innovative contributions in education and training, policy and governance, decision-making, and awareness of the use of games and simulation, the theme is constantly evolving (ISAGA, 2019). As an example, according to Wright-Maley & Joshi (2017), simulations not only give high school history teachers an opportunity to approach the past from a current perspective, but also provide an environment that can lead to a deeper learning. Other examples of the use of games in high schools are the creation of a business-game-supported secondary education curriculum, where the author gives insight into the end-product design process and teaches students economics and business, such as demand modelling. Examples of econometric decision modelling, and scenario design

insights, where program material provides a broad view of the scope and nature of a market (WARDASZKO, 2016). At last, a research applied concurrently in Brazil and Poland in order to identify aspects of business morals and ethics in a simulated environment (TITTON, BARÇANTE, JAKUBOWSKI, 2016).

Blažič & Blažič (2017), analyzing the missing elements in the taxonomy of an existing game group, proposes the design of a new category that addresses the educational properties of the game. Business Games are also Social Games (STOLZ, LINDEMANN, ANTONIETTI, 2019) because interactions between players (students) involving goal attainment, sharing rules and resources as well as role playing in a spatial and temporal context are inevitable.

The *Interschool Business Games Tournament* (TEIAR) is a model of Simulation & Gaming (S&G) applied by Barsanti Business & Gamification (B2Gi) in Brazilian high schools, which involves technology and ludic approaches, aiming to disseminate entrepreneurship concepts according to Brazilian Business Excellence Model. This game is similar to JOGAI (BARÇANTE, 2010; BELTRÃO & BARÇANTE, 2015).

TEIAR takes place at four different meetings. B2Gi has developed and implemented a business game tournament to highlight the entrepreneurship and its respective actions.

In TEIAR, the students answered a correlation matrix in order to analyse the intersection of four meetings with the ARCS model, which indicated positive correlations (+) and negative (-). This matrix is response at the finish of TEIAR.

The ARCS Model is a problem solving method to planning the motivational features of learning environments to persuade and sustain students' motivation to learn (KELLER, 1983). There are two major parts to the model. The first is a set of categories representing the components of motivation. These categories are the result of a synthesis of the research on human motivation. The second part of the model is a systematic design process that assists you in creating motivational enhancements that are appropriate for a given set of learners. The synthesis permits to recognize the several features of student motivation, and the design process helps to shape the motivational characteristics of students in a given learning environment and then design motivational tactics that are appropriate for them. The ARCS Model has been used in junior high and high schools and other organizations; in every setting in which, there is a requirement for people to learn.

METHODOLOGY

The market in TEIAR is made up of students playing the role of Suppliers (2 to 4), Manufacturers (2 to 5), and Retailers (2 to 4), competing among themselves in the same industries (toys). The companies are evaluated by themselves and an Audit Committee formed by one teachers at most. The number of participants at each TEIAR can vary from 20 up to 30 students.

In case of 30 students in all, they are grouped into different companies: 3 Suppliers (2 students/each Supplier), 4 Manufacturers (4 students/each Manufacturer) and 4 Retailers (2 students/each Retailer). For groups of other sizes (not 30 students), other configurations are possible if it remains the same numbers of participants in each segment.

Each of them lasts two hours, totalizing eight hours.

1st meeting - At the beginning of the first meeting, the teachers introduce themselves and explain their role at TEIAR. They also ask the students to introduce themselves. Afterward, the head teacher splits the class into three-student groups and asks each group to draw up a list of three organizations (companies, NGO, association, soccer team etc.) which they consider as an excellent

EXHIBIT 1
Brazilian Business Excellence Model (MEG)

organization and the fundamental causes to achieve success. Carrying it on, the head teacher asks each group to write its own list on the white board. After that, he starts to gather the similar fundamental causes – items out of a larger set. Such being the case, he begins to design, along with the students, TEIAR business excellence model by the whole class.

This moment, the head teacher shows Figure 1, which represents Business Excellence Model (BEM) of Brazilian National Quality Foundation (FNQ). FNQ is a member of Global Excellence Council (GEC) that "consists of organizations that are recognized globally as the guardians of premier excellence models and award programs in their geographic regions." Brazilian companies have used this model since 1991. The head teacher, thus, asks the students to point out the similarities between their model contents and BEM contents. He comments the answers.

The head teacher, then, asks the students what the difference between a magnet iron and an iron bar is. The teacher explains that the difference lies in the fact that the magnet iron bears its own "business model", i.e. electrons of last orbital spin around the same direction. Therefore, each atom turns out a little magnet iron whose magnet field adds to the other "partner". It brings about a powerful magnetic field and a strong attraction capacity. Comparatively, phenomenon of this sort takes place in organizations under a BEM: they are "magnetized" since they are remarkably powerful to attract clients, suppliers, investors, business partners as well as respect and admiration from society. Conclusively, they definitely make the difference.

So the first meeting finishes with the students highly motivated since they recognize they know to some extent the game subject – business management. However, they still have to develop skills and attitude. In other words, "knowing how to do" and "wanting to do". It all strongly draws their Attention to the TEIAR.

2nd meeting (Rehearse) - The head teacher splits the classes by drawing lots to build up the companies separately – Suppliers, Manufacturers, and Retailers. He introduces the classes to their respective audit teachers. In case one of the students intends to trade places with another student, it's necessary that the other student is willing to do so.

The teachers present to the students the questions used to evaluate the companies.

Afterward, the head teacher introduces the concepts of Costs, Expenditure, Revenues, Cash Flow, Pricing among others as well as respective information for each type of company, that is, its start-up capital, payment roll, variable costs, pro-labor, and taxes. At the end, as an example, he shows a break-even point curve for the Manufacturers.

Carrying on the process, the head teacher shows how the students should fill out the Excel Spreadsheet: Simulator, Purchasing, Sales, Other Revenue and Expenditure; and Evaluation. Figure 2 and Figure 3 show examples of Excel Spreadsheet duly filled out to Manufacturer "K"

The ability/skill to manage the dynamics of business is a prerequisite for a good performance in TEIAR.

The management competence of each company's processes: understanding the clients' expectations and needs, manufacturing and better quality services, and the socio-environmental commitment will be a determining factor for the companies' optimal performance.

3rd meeting (Move) - At this meeting, it is put into practice which was showed at 2nd meeting, by means of "learning by doing". It is the very day of experiential learning when all students work on TEIAR information - buying, producing, selling, filling

EXHIBIT 2
Excel Spreadsheet Simulator of Manufactor "K"

EXHIBIT 3
Excel Spreadsheet Evaluation of Manufactor "K"

	SUP1	SUP2	SUP3	SUP4	
2	3	4	3		Supplier conducts customer satisfaction surveys. (after sales).
3	4	5	4		The Supplier implements improvement actions based on the results of the satisfaction surveys and their complaints.
4	3	4	3		Supplier knows your current and future (pre-sale) expectations and needs.
5	3	4	3		Supplier evaluates and improves its product based on your information.
6	3	5	4		The Supplier has a product line differentiated by quality.
7	3	5	4		Best Delivery Lead Time (period from the time the buyer confirmed the purchase until the product was received).
8	3	4	3		The Supplier met all the expectations and needs of your company.
9	3	4	3		Considering all the evaluated items, what grade do you give to Manufacturers?
10					
11	RETA	RETB	RETC	RETD	
12	5	5	2	3	The Retailer sought to partner with your company.
13	5	4	1	3	The Retailer implemented improvement actions due to the partnership made with his company.
14	5	5	2	3	Considering all the items evaluated, what grade do you give to Retailers?

TEIAR

APRENDENDO A EMPREENDER EM REDE

Tabs: MANUFACTURER "K" SIMULATOR | MANUFACTURER "K" PURCHASING | MANUFACTURER "K" SALES | OTHERS REVENUE AND EXPENDITURE | MANUFACTURER "K" EVALUATION

the invoices, negotiating, and assessing. At such meeting, they are also assessed by the Auditors Committee. It is all for real.

4th meeting (Feedback and Results) - Debriefing event takes place exclusively at the fourth meeting. On this occasion, the head teacher presents and discusses all the quantitative and qualitative results that each company has achieved in TEIAR.

The head teacher undertakes the inherent activities by first dividing the whole class into different work teams (depending on the size of the class). The components of each work teams are Suppliers, Manufacturers, and Retailers originally from different companies. It is worth underscoring that the number of work team components as a whole, holding the same position, are not even among the work teams themselves. As to representativeness there may also be uneven number related to each company.

Once defined the work teams, each of them is supposed to answer three questions:

- Which is the best Supplier performance? Justify the answer.
- Which is the best Manufacturer performance? Justify the answer.
- Which is the best Retailer performance? Justify the answer.

After each work team enters the answers and justifications onto the white board, the head teacher starts the presentation of the results from the assessment forms by comparing the companies' data with those from the assessment forms. The Audit Committee then supports them.

Before presenting the winning company, the head teacher hands out a comprehensive and detailed survey form on a number of aspects of the game.

At the end, the head teacher explains the ARCS Model to students and applies the matrix TEIAR x ARCS Model.

THE ARCS MODEL

Keller (2016), together with the help of several graduate students, created a synthesis of motivational concepts that provided a foundation for the development of a systematic motivational design process.

This model consists of two core parts: a set of categories and a systematic design process. The first part represents the constituents of motivation, a synthesis of the research on human motivation. This synthesis leads you to identify the several features of student motivation. The second part supports you in producing motivational improvements that are applicable for a given set of learners, and helps you outline the motivational features of students in a specified learning situation and then plan motivational policies that are suitable for them.

The ARCS Model had been used and certified by teachers in elementary and secondary schools, colleges and universities, non-profit organizations, and military organization. In other words, in practically every situation in which there is a necessity for people to learn around the world, mainly on these continents: Asia, Europe, and Latin America (KELLER, 2006).

We could say that most people tend to come in routine. One problem handled by many teachers is that they have particular "tried and true" procedures that are easy to apply, but they may find it difficult to get fresh ideas or a well-balanced set of ideas.

One of the aims of Motivational Design is to formulate a set of motivational tactics that reach the learners' expectations and

complement the completely instructional plan. To do this, one must have a good knowledge of the various characteristics of student motivation and understand what types of tactics fit each characteristic.

It can be hard to this since there are various elements in a course that can influence motivation. They include the aids you use; your own performances' as an educator; the structure of a lesson that requires different types of actions at the beginning, in the middle and at the end; and the whole structure of the course with its several units and lessons.

According to Keller (2010), ARCS model is a synthesis of motivational concepts and characteristics into the four categories of Attention (A), Relevance (R), Confidence (C), and Satisfaction (S). The four categories of the ARCS model (Table 1) proposal provide aid in each of these categories. Each category has subcategories and is sustained by specific psychological concepts. For each of those components, there are psychological theories that support the theoretical basis for the component. Also, there is a list of questions that operate as a "work aid". For example, the issue concerning "motive matching" under Relevance asks, "How and when can I match my instruction to the learning procedures and individual interests of the learners?" The whole list of queries can help you examine your tactics to teaching or preparing instructional resources and can be used as a checklist to examine your present materials and lesson plans. Likewise, the questions can be used as a fount of ideas that help you motivate and improve your teaching.

EXHIBIT 4
ARCS Categories

Attention	Relevance	Confidence	Satisfaction
A1 Perceptual arousal	R1 Goal orientation	C1 Learning requirements	S1 Intrinsic reinforcement
A2 Inquiry arousal	R2 Motive matching	C2 Success opportunities	S2 Extrinsic rewards
A3 Variability	R3 Familiarity	C3 Personal control	S3 Equity

Search: https://www.arcsmodel.com/arcs-categories

Henceforth, Motivational Design comprises a logical process that holds these steps and results in the planning of learning environments that include activities that have an anticipated impact on the magnitude and direction of a person's behaviour. Motivation lies on the effort somebody is eager to apply in pursuing a goal; thus, motivation has magnitude and direction. As a result, Motivational Design is about linking instruction to the aims of learners. It offers inspiration and suitable stages of challenge that impels how the learners will feel pursuing successful achievement, or even failure (TASLIMI, 2019).

ANALYSIS

In TEIAR' case, we have developed a correlation matrix in order that each student analysed the intersection of four meetings with the ARCS Model, which indicated positive (+) and negative correlations (-). The Correlation Matrix was applied to 472 students, 24 high school classes at 7 schools in the Rio de Janeiro City, Brazil, between 2015 and 2018 at finish of the 4 meeting. The results are shown in Table 2.

Analyzing Table 2, we can see that the students evaluated TEIAR in accordance with what is said in ARCS Model, because the students recorded thirty-three positive correlations against five negative correlations.

In the first meeting of TEIAR (Class Business Model Creation), ten positive correlations and only one negative correlation were identified for Confidence. This negative correlation reflects teens' frequent doubts about their own future lives.

In the 2nd meeting (Rehearse), seven positive and two negative correlations were obtained, one for Attention and one for Satisfaction, both related to reading the TEIAR Manual.

In the 3rd meeting (Play), seven positive correlations and one negative correlations regarding Satisfaction were also recorded because teams realized their companies have fallen short of their bargaining power.

In the 4th and last meeting (Feedback and Presentation of Results) there were nine positive correlations and only one negative correlations for Satisfaction, which is due to the fact that only one company wins the game and no one likes to lose; on the other hand, individual and mutual learning was valued by the students.

CONCLUSIONS AND RECOMMENDATIONS

Recent changes in the Brazilian government's high school education guidelines introduced an emphasis on soft skills.

Exhibit 5
Correlation Matrix TEIAR Meetings x ARCS Model

TEIAR	ARCS Model			
	Attention	**Relevance**	**Confidence**	**Satisfaction**
1st Meeting	(+) Voluntary participation motivated by curiosity and/or interest on the students and teachers' parts. (+) Group activities having students and teachers' commitment.	(+) Recall and modeling of collective unconscious related to successful business. (+) Link between scientific concepts learned at school with business excellence models.	(+) Students as well as teachers are intuitively aware of business excellence. (+) Use of everyday language of the subject matter. (+) The student states that already have knowledge of finance-accounting terms. (-) Students' doubts about their major role model toward paving their path toward future. (+) The teacher-coordinator sees himself as a mediator of knowledge for students.	(+) Groups formed by classmates. (+) Teachers and students already know each other.
2nd Meeting	(+) ELKA Magic Pins. (+) The TEIAR teams selected by randomly. (-) Reading of the TEIAR rules (long time-consuming activity).	(+) Concepts presented are part of the knowledge and experience of students.	(+) The student is a company member and is one of responsible for it.	(+) Challenge for the next meeting: the game is for real. (+) Company work teams formed. (+) Auditing teachers see themselves as mediators of knowledge for students. (-) Reading of the TEIAR rules (long time-consuming activity).
3rt Meeting	(+) Work teams focused on their own business. (+) Purchase, production, and sale of products.	(+) Business language compatible with the students' language.	(+) Students apply intuitively the business concepts. (+) Students realize they are responsible for the success or failure of their respective teams.	(+) The game dynamics itself. (+) The game rules are clear and there is no favoritism. (-) Our company falls short of trading power.
4th Meeting	(+) The feedback comes from the students.	(+) The feedback approach is the students' language indeed.	(+) Students play the main role. (+) Teachers play the facilitating role in the learning process.	(+) Students naturally conclude that the result lies on their respective team outlook and interaction. (+) The real winner is the one who comprehends the potential over his knowledge; besides developed skills, changed attitudes, interaction with his mates constructively. (+) Teacher's resume upgrade ensue. (+) All TEIAR participants awarded certificates. (-/+) Since it is a competition, there is only one winner. On the other hand, every participant enhances his outlook by going through experiential learning.

TEIAR has been a tool that helps schools to adapt to this new Brazilian educational reality.

In line with what was explained, many schools offer motivational lectures for mid-level students to help them choose which college to pursue. Although TEIAR requires more time and school aids, it is believed that participating in such a game can give the students a better idea of what their professional activities would be like in the future, reducing these gaps.

Motivational aspects have a great influence on the students' professional choices so TEIAR, in the students' opinion, completely meets Keller's ARCS Model.

According to what has been seen in this article, it is suggested that other researchers address the Motivational Design theme in their S&G experiments. The analysis of ARCS Model's relations with the S&G can contribute to the motivational aspect of the students, becoming an important ally of the S&G researchers.

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