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## **DEVELOPMENT AND VALIDATION OF AN INSTRUMENT TO MEASURE SOCIAL CONSTRUCTIVISM IN A VIRTUAL CLASSROOM**

**Karuna Samuel Finch**

*International American School, Warsaw, Poland*

[karunafinch@gmail.com](mailto:karunafinch@gmail.com)

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### **Abstract**

*Virtual learning has never been an option for secondary education, but the pandemic situations have blurred this line. A considerable population of school students has been attending school from home for roughly five months now. Social Constructivist pedagogy is the need of the hour and, multiple research focussed on effective teaching and learning have endorsed it. Presently, there are no validated Instruments that, can measure and monitor the Social Constructivist domain, in a synchronous virtual classroom. This study discusses an Instrument developed to measure the social constructivist dimension of a virtual classroom in light of the concepts of Social Constructivism and Cybergogy. This paper includes an assessment of the pilot study. The evidence for the validity (Cronbach's alpha) and construct reliability of this Instrument assure that the presented assessment tool is well suited to measure the Social Constructivist dimension of a secondary level virtual classroom.*

### **Keywords**

Social Constructivism, Virtual Learning, Questionnaire, Secondary Education, Instrument

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## **1. Introduction**

Face-to-face learning has been the predominant way to learn in all secondary schools. It is because, besides providing for academic knowledge, they also have other social functions. (Bjørndal and Gjesdal; 2020). Bruner (1977) describes learning as an active and personal process in which learners construct new knowledge and concepts based on their current information. Social constructivists, a sub-sect believe the interaction of the learners with others - teachers, peers, and other members of the society, is indispensable to learning. (Rannikmäe et al.; 2020). Secondary 'physical schools' platform both; social interaction and learning. In addition to these provisions, schools provide a safe place for parents to leave their children while they are at work. And for these reasons, amongst many others, physical schools have always been an important part of our society. (Long; 2020) Physical schools, therefore, have functions beyond academics. Reportedly, teachers in most countries are trained to function in face-to-face situations (Albiser et al., 2020). However, the current pandemic and social distancing requisites have demanded many schools to go online, and this is the new normal' in many countries across the globe (Erling; 2020, Patton;2020, Sunil;2020). This abrupt shift has presented an unprecedented challenge for the teachers and has brought into light the importance of creativity and innovation while writing lesson plans for a virtual classroom. It's now "through either significant change in the use of particular educational practices or the emergence of new practices in an educational system as a whole or its chosen aspect" that adjustments must be made to teaching practices and lesson designs to fit this contemporary issue. (Madalińska-Michalak, 2017).

This paper has adopted a comprehensive definition of social constructivist education. Social Constructivism defines learning as a personal construct which is a fabrication of the learners' interactions with other members present in the classroom. These members can be classmates learning at the same level or more knowledgeable individuals like the teachers or special guests invited into the class. In this case, interacting with working professionals are authentic learning moments as much as, the real-world subject matter introduced by the teacher at the commencement of a lesson. (Applefield et al.; 2000, Rannikmäe et al.;2020). Educational research has always recommended the importance of contemporary pedagogical approaches (Celli & Young, 2017). Following this, many teachers have reformed their lesson plans to suit the current classroom scenario i.e. a classroom lacking direct contact between them and the students. These modifications have been by incorporating virtual learning resources available in the market by using innovative and contemporary pedagogical

practices. The Instrument examined in this study can be used to inquire into the efficiency of such lessons by mapping the social constructivist dimension of a virtual classroom. The term 'classroom' will always imply a 'secondary school classroom' in this paper.

The rest of the paper is structured as follows; the theoretical and conceptual framework of the study is in the second section; the third section describes the method used for developing and validating the Instrument and the fourth section presents the quality of the Instrument. A critique and future scopes are deliberated under the fifth section and, the conclusion includes a synopsis in the sixth section.

## **2. Theoretical and Conceptual Context**

The presented instrument is divided into six categories. This part of the paper discusses the theoretical basis of the categories and items included in the Instrument and aims to justify the choices.

### **2.1. The Pedagogy arising from the Combination of Social Constructivism and Cybergogy**

Although the psychological lexicon incorporated 'constructivism', 'constructivist' and other analogous words in the second half of the 20th century, the guiding perceptions of constructivism have existed much before that. (Pritchard & Woollard; 2010). Constructivism, in the broadest sense, is more than a 'theory of learning' (Applefield et al.;2000) but for this paper, we will fixate on constructivism as a theory of learning and Social Constructivism as a subdivision of this theory. Constructivism proposes that the act of learning is an individual matter. Two or more learners that might be a part of the same learning experience and settings will never have identical learning outcomes. This difference is because all individuals amalgamate knowledge and events differently. Social Constructivism emphasizes the value of social context in learning. There are two facets of this, first what the learner has acquired about the culture like, the language, the logic, etc., in their lifetime within the society they are seated and second, social interactions with other more learned members. Hence, we can assert that 'culture' and 'context' are two indispensable conditions for learning. Meaning, learning is effective and lasting when the learner is engaged in social activity and when new knowledge constructs on pre-existing knowledge and understanding. Vygotsky propagated this notion of acquiring knowledge in the conception of 'the zone of proximal development'. He categorically stressed the importance of scaffolding for a student, 'the less knowledgeable', by the teacher 'the more knowledgeable'. (Vygotskiĭ & Cole, 1978). Learning does not follow a foreseeable and pre-calculated trail. Veritably, the outcome is uncertain and dependent on how a learner chooses

to interact with their surroundings at the physical, biological, psychological and sociological levels. Therefore, Social Constructivism is premised, on the understanding that the cognitive exchange between society and the learner leads to knowledge construction. (Moshman;1982, Brown et al.; 1989).

Pedagogy is the art and science of teaching children (Knowles; 1978). Not so long ago, a contemporary subfield of pedagogy has surfaced as an application of didactic technology called 'Cybergogy' (Wang & Kang; 2006, Pritchard & Woollard; 2010). This subfield is involved with the precepts and system of teaching and learning through the Internet. Further developments to this sophisticated concept of Cybergogy have been carried out to standardize and structure the delivery of virtual experiences. These developments also ensure the compatibility of the course with the four learning domains – cognitive, affective, dexterous, and social. (Scopes; 2009). Hence, Cybergogy provides a set of guidelines for developing virtual learning modules that guarantee the holistic involvement of the user.

To summate, the pedagogy that arises from the combination of Cybergogy and Social Constructivism is well suited to the current situation of virtual learning. Several actions that must be performed at some point in the virtual course to ensure a Social Constructivist domain in the virtual learning space are;

- Inform the students what they are learning and why they are learning;
- Afford opportunities to make the student feel in control of their learning;
- Present spaces for active engagement in the cognitive, kinesthetic, and social domains;
- Expand on the students' preceding knowledge and experiences;
- Structure the learning experience upon an awareness of the curriculum;
- Engage with students through challenges and conversations;
- Be conscious of the emotions of the student; and,
- Ensure that the learning activities have a real-world context. (Powell & Kalina, 2009; Pritchard & Woollard; 2010, Prashanti & Ramnarayan, 2020)

So, while a student's engagement with the presented learning opportunities frames their knowledge, the teachers' role is to ensure the provision of such a Social Constructivist learning environment by including the eight points mentioned above in their lesson designs. Even in a virtual classroom, the essences of Social Constructivism will eventually manifest themselves and, they can be spotted as characteristic learner behaviors and instruction practices. The character of these teaching

practices can be mapped to discern whether they enable the Social Constructivist dimension in the virtual classroom.

## **2.2 Approaches for Measuring Social Constructivism in a Virtual Classroom**

Although distance learning has existed for some time (Laadem, 2017), synchronous virtual classrooms are new phenomena at the secondary level of Education. There have been multiple ways of mapping the many aspects of distance learning. Be it the degree of students engagement levels in an online course (Dixson, 2015), the measure of social presence and connectedness (Wei et al., 2012), course satisfaction of the online learner (Sebastianelli et al., 2015), self-efficacy for distance learning (Wladis & Samuels, 2016), self-regulation for MOOCS (Jansen et al., 2017), students aptitudes towards cooperative learning in an online environment (Korkmaz, 2012), the degree of a students performance (Osborn & Turner, 2002), the retention rate of a course (Lee & Choi, 2013) or student attrition (Thompson, 1999). However, measuring the social constructivist dimension of a virtual classroom in a secondary school is yet to be explored, which is the undertaking of this study.

## **3. Method for the Development of the Instrument**

This section covers the following about the instrument; its conception, creation, validity, and reliability.

### **3.1 Development of the Instrument**

This Instrument is a skillful adaptation of the categories and indicators narrowed down by Partlow and Gibbs (2003). Its refinement reflects the virtual learning environments more closely with an explicit emphasis on secondary schools. The Instrument is designed as an online survey that consists of thirty-three items clustered under five categories. Table 1 includes clear definitions of these categories. The thirty-three items are a derivation of the indicators that manifest the mentioned categories. Table 2 presents selected items in the Instrument. The respondent must select one of five options on the ordinal scale ranging from 'Never' to 'Always'. All of the items are worded positively, so a response of 'Always' reflects a positive socially constructivist environment. A complete list of items is present in Appendix A.

**Table 1:** *Categories for Assessing Social Constructivist Learning Environments*

<b>Category (Category Code)</b>	<b>Description</b>
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Authentic, Relevant, and Meaningful (AUT)	Students should get practice doing what real people do and must be afforded experiences with tasks that are equivalent to the practices of an actual group or community in the society.
Tasks that require higher cognitive skills (COG)	Work that necessitates the use of skills like problem-solving, critical or reflective analysis, evaluation, or creating. (Krathwohl, 2002)
Collaborative and cooperative small group work (COLL)	Learning spaces that demand symbiotic interactions between students to achieve a learning goal. This also includes opportunities to create knowledge and material using physical and virtual tools, like a measurement tool in math, a virtual lab in science, a flat brush in art, etc., or discussions like a debate in history, a symposium in biology, etc.
Project-based learning tasks (PBL)	Projects that cover tasks demanding the pupil’s expansion of awareness of important subject matter in the real-world and make learning tangible.
Safe environment (SAFE)	A safe environment is a fundamental requisite to the process of learning for most learners. This includes the student’s ability to approach the teacher and peers in the course without any hesitation.

**Table 2:** *Some Items in the Instrument*

<b>Item Codes</b>	<b>Description</b>
AUT	Assignments I complete are related to real-world settings
AUT	I could see a logical connection connecting the learning task to a worthwhile practice. (For eg. I can see that learning about the environment will help me make informed choices about what I buy from the market)
AUT	I understand what I am doing in a task and why I am doing it.
COG	I am provided sample tasks or methods to help me understand what I’m supposed to do in a task.

COG	I critically evaluate my own (and others') work. (After a test I can check my answers with a mark scheme and understand what I did wrong)
COG	I have participated in an activity that required me to tutor or mentor someone.
COLL	During group work, my team shares with others what we are doing and we react to the progress or final products of other teams.
COLL	I have negotiated with my teacher or peers about something. (Eg. While we were writing an essay, we discussed and negotiated the word limit)
COLL	I participate in collaborative and cooperative small group work (this would include: chat discussions, discussions with outside experts, small-group exercises, projects with multiple authors.)
PBL	I completed projects for which I was given some general guidelines as to possible projects to complete, but I decided what is relevant and meaningful to me while completing it.
PBL	I have completed projects that are open-ended in nature. (for example, you are asked to investigate a civilization where you can choose which civilization you would want to work on)
PBL	I share my project drafts with my peers during development and completion and ask them for feedback.
SAFE	I feel trusted and supported by my teachers
SAFE	I can freely communicate with my teachers and peers.

### **3.2. Pilot Study and Sample**

The survey was administered to students of a secondary International School through the Google Forms platform, a common medium used by the school. The first section of the Google Form briefly explained the survey and the significance of the student's involvement in the study. The survey completion was voluntary and anonymous. An adult was available to explain what the questions meant; should there be a doubt. The students were explained how to fill out the form. This included interpreting the answer-scale, the abbreviations, and what they should consider while answering the

questions. All the students who participated had experienced at least four months of virtual schooling and spoke English at a minimum B1 level. The schools' official list confirmed the student's English levels. At the time of this study, the school had students from regions of; central, western and eastern Europe, Asia Pacific, Middle-Eastern nations, Mainland China, Northern America, and Eurasia enrolled for the current school year. Of the 111 students invited to participate, 90 responded; the response rate was a soaring 81%.

#### **4. Quality of the Instrument**

The quality of an Instrument is controlled in the following two ways; the extent to which the instrument measures what it intends to measure i.e its validity and, the consistency with which the Instrument provides the same outcomes when used again i.e. its reliability. (Taber, 2013) This section provides evidence for both the validity and reliability of the Instrument.

##### **4.1 Reliability of the Instrument**

The reliability of the instrument was assessed using Cronbach's alpha, which is a widely accepted method for examining the internal consistency hence the reliability of a scale (Field et al., 2012). The results are in Table 3.

**Table 3:** *Reliabilities (Cronbach's  $\alpha$ ) for the Five Categories used to Measure the Social Constructivist Dimension*

<b>Category (Category Code)</b>	<b>Number of items</b>	<b>Cronbach's <math>\alpha</math></b>
Authentic, Relevant, and Meaningful (AUT)	7	0.6
Tasks that require higher cognitive skills (COG)	11	0.8
Collaborative and cooperative small group work (COLL)	7	0.7
Project-based learning tasks (PBL)	6	0.7
Safe environment (SAFE)	2	0.5

The psychometric criteria of reliability were assuring for three of the five categories (Tasks that require higher cognitive skills, Collaborative and Cooperative tasks, and Project-based Learning tasks) with the values of Cronbach's alpha  $\geq 0.7$  (George & Mallery, 2003). A lower value of Cronbach's alpha for Authentic, Relevant, and Meaningful (Cronbach's alpha = 0.6), can be justified on the following grounds. As the name of the category indicates, it aims to measure three aspects



within the same category. These are unique yet interrelated. And although combining these items under the same category lowers the reliability score but pragmatically, it makes sense to keep them this way. As of the Category labelled 'Safe', the values are reasonable (Cronbach's alpha = 0.2) as there are only two items in this category. Increasing the item number will lead to a satisfactory value for Cronbach's alpha in this case.

It is important to be mindful that measuring a particular dimension of the learning environment can be subjective to how students perceive the environment on many occasions. Obtaining similar results repeatedly when testing the reliability of an instrument devised to measure a subjective-scale might be unattainable. It is because students are regularly growing in experience and may answer the same question differently. This inevitable situation can lead to conflicting assumed realities. (Taber, 2013)

#### **4.2 Validity of the Instrument**

The Construct of an instrument can be validated at three distinct phases during the study (Flake et al., 2017). Phase one, the Substantive Validation. It is actualized during the Literature review stage to establish the breadth and depth of the Instrument (Ary et al., 2010) and can also be accomplished, by Expert review for item development (Gehlbach & Brinkworth, 2011). Phase two is Structural Validation, done by reliability tests to assure the internal consistency between the items. Lastly, Phase three is External Validation, which is possible through Convergent and Discriminant techniques.

First and foremost, the substantial phase of assuring the validity has been covered under section 2, which extensively discussed the theoretical and conceptual concepts used to identify the categories under which the items have been developed. Also, as mentioned in section 3.1, the items of the Instrument are adapted from a study conducted by Partlow and Gibbs (2003). Their study involved a group of experts in instructional technology and Constructivist learning principles that arrived at the indicators of a virtual Constructive learning environment through a 3-round Delphi survey. These indicators have been used to inform the items of the Instrument. Unfortunately, it is not possible to carry out a convergent validation of this tool as currently, no comparable measures exist that capture the dimension of the virtual learning environment presented in this paper.

## **5. Criticism and Scope of Future Research**

A Social Constructivist classroom embodies the subsequent facets in its framework; analytical thinking, incentivized learning, learner autonomy, constructive criticism, uninhibited collaborative dialogue, vocabulary expansion, explanation, probing, mastering topics through teaching, contextualization, investigating, and real-life problem-solving. (Brophy & Alleman; 1998, Sawyer; 2004, Rahmawati et al.; 2020). This study aims to shape an Instrument to measure the social constructivist dimension of the virtual learning environment. Such an environment has a direct relationship with the design and implementation of the course. Although this Instrument can be refined further, it is suitable in its current state to serve as a guide for;

- Constructing a virtual-course from scratch
- Rating a pre-existing virtual-course; and
- Refining a pre-existing virtual-course.

This Instrument segregates the items under five categories. The segregation is useful in highlighting the specific Category that requires improvement when using this Instrument to refine a course. This study is a pilot study and, the following recommendations are proposed for the revision of this Instrument.

- Currently, there are two items under the SAFE Category. Similar items can be included under this Category to improve its reliability.
- The Instrument can be validated further with different student populations. Administering it to students studying different curriculums can serve as a robust validation technique.

## **6. Conclusion**

Learning is a lifelong practice. (Aspin; 2007). As we have proceeded from the ‘industrial’ era to the ‘information’ era, the possibility to present students with all the education that they will require in their lifetime within the K-12 schooling stretch is no longer achievable. (Pritchard & Woollard; 2010). The demographics and student needs saw further modifications by COVID-19 as now teachers and students connected via a ‘screen’ in a virtual class. The educational paradigm of “Social Constructivism” is an alternative to address this prevailing learning situation to a successful extent. Under the pretext of social distancing, technology has played an unparalleled role in fostering learning (Finch et al.; 2021) in shared environments and has laid grounds to carry out constructivist approaches

that would have been challenging to accomplish otherwise (Iivari et al.; 2020). Being online has emphasized the need for students to be active and self-directed participants in learning, which are crucial precepts of Social Constructivism. In addition to this, the students must use the delivery medium (the Internet) as a valuable and multidimensional space for communication with the teacher, the other students in the class, and other professional guests in the class and actively seek out knowledge. However, for the students to achieve these the design of the course must allow them to do so.

This study presents an online survey as a measuring Instrument to gauge the social constructivist dimension of the virtual learning environment. According to the mentioned reliability results, the Instrument can be employed for practical application to measure the dimension of Social Constructivism. The Instrument presented in this study can be used as a valuable starting point for further extensions, e.g., as a reflection tool for instructors or an assessment tool for teacher-tutors.

Over and above, while the Instruments can help confirm the social constructivist dimension of the learning environment, the onus to exploit the situation, engage with the learning spaces, and construct knowledge for themselves still lies on the student.

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## **Appendix A**

### **Instrument Items**

#### **Authentic, Relevant, and Meaningful (AUT)**

- I understand what I am doing in a task and why I am doing it.
- I have experienced methods of authentic practices like making or building things; analyzing problems; designing solutions; trying out solutions; testing and evaluating solutions.
- Special guests are brought in to discuss an emerging field or hot topic.
- I have opportunities to revise or modify my assessments.
- Assignments I complete are related to real-world settings.
- I have lead discussions in online my class.
- I could see a logical connection connecting the learning task to a worthwhile practice. (For eg. I can see that learning about the environment will help me make informed choices about what I buy from the market)

### **Tasks that require Higher Cognitive Skills (COG)**

- I am provided sample tasks or methods to help me understand what I'm supposed to do in a task.
- I critically evaluate my own (and others') work. (After a test I can check my answers with a mark scheme and understand what I did wrong).
- I have exhibited creative use of my knowledge. (Eg. I have designed a lab activity).
- I revisited and improved my assignment because I understood it better at a later step. (Eg. I submitted a second copy of my presentation as I had explained my topic better on it).
- I have participated in 'what if' discussions that require me to think beyond what I have covered in my class.
- I have participated in an activity that required me to tutor or mentor someone.
- I have participated in an activity where I considered and proposed alternatives.
- I have constructed, built, or enacted something that is abstract in theory or idea. Like a poem or a song.
- I have analyzed online case situations and reacted to the posts of their peers' case solutions.
- I got the chance to describe my work from my perspective/belief. (For eg. I presented my point of view about racial discrimination).
- I have used my knowledge to solve local problems and situations.

### **Collaborative and Cooperative Small Group Work (COLL)**

- I have had the opportunity to take part in group activities.
- I have negotiated with my teacher or peers about something. (Eg. While we were writing an essay, we discussed and negotiated the word limit).
- I or my class has created grading rubrics with my teacher.
- I have received a grade simply for participating in an activity; like a discussion.
- I participate in collaborative and cooperative small group work (this would include: chat discussions; discussions with outside experts; small-group exercises; projects with multiple authors).



- I experienced that the process of collaborative work is as important as the final result. (eg. in a group project I noticed my partner had made good contributions which raised the quality of the final work)
- During group work, my team shares with others what we are doing and we react to the progress or final products of other teams. (For. eg. Group 1 posts, “hey we are on Q4” and you respond it that comment)

### **Project-based Learning Tasks (PBL)**

- I explore important problem areas and ask questions, debate ideas, make predictions, and draw conclusions while creating relevant artifacts. (an artifact can be the end product like a poster, an essay, an article, a lab report, a presentation, an artwork, etc).
- I share my project drafts with my peers during development and completion and ask them for feedback.
- Projects I work on are authentic (takes place in a real-world setting with real-world participants).
- I have completed projects that are open-ended in nature. (for example, you are asked to investigate a civilization where you can choose which civilization you would want to work with).
- I have completed a variety of project-based learning tasks that would include: design and development projects; research and evaluation projects; analysis and critique projects; scenario and case responses; knowledge-based development projects.
- I completed projects for which I was given some general guidelines as to possible projects to complete, but I decided what is relevant and meaningful to me while completing it.

### **Safe Environment (SAFE)**

- I can freely communicate with my teachers and peers.
- I feel trusted and supported by my teachers.