

The construction and validation of a new scale for measuring features of constructivist learning environments in higher education

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Abstract

This study was aimed at mapping features of constructivist activities in higher education settings, constructing and validating a new scale for measuring their presence in lecture face-to-face based environments (LBE), seminars (SM), and distance learning environments (DLE). A mix-method approach was implemented in three phases. The first phase was aimed at qualitatively analysing classroom observational activities as experienced by students, in order to learn about actual instantiations of the theoretical constructivist features. The results foregrounded eight categories: 'knowledge construction', 'authenticity', 'multiple perspectives', 'prior knowledge', 'in-depth learning', 'teacher- student interaction', 'social interaction' and 'cooperative dialogue'. The second phase was aimed at developing a questionnaire, based on the descriptions gathered in Phase 1. The third quantitative phase was used to validate the developed questionnaire (Constructivist Learning in Higher Education Settings scale [CLHES]) by using structural equation modelling. In addition, students' academic self-efficacy had been chosen as a criterion variable in order to further assess construct validity of the CLHES. Lastly, a multivariate analysis of covariance was applied to allow the characterisation of differences between the learning settings in regard to the CLHES eight factors and academic self-efficacy. The scales were submitted to 597 undergraduate third-year college students. According to the main results: construct validity of the new scale has been confirmed; teacher-student and student-student interactions were positively connected to self-efficacy for learning; and SM were perceived as generally more constructivist when compared with the other learning environments. Implications of these findings and directions for future research are discussed.

Keywords: *Constructivism; Academic self-efficacy, Higher education*



1. Introduction

Educational practice is continually subjected to renewal needs, due mainly to the growing proportion of information communication technology, social changes, globalisation of education, and the pursuit of quality. The accelerating rate of social change puts a premium on adaptability to the emerging requirements of present society such as communication and cooperation skills, and ability to critically select, acquire, and use knowledge (Quisumbing, 2005; Wegerif & De Laat, 2011). These types of renewal needs require developing updated instructional practices that could integrate knowledge with the personal transferable skills (Pellegrino & Hilton, 2012). In order to meet the demands of 21st century learning needs, the creation of learning environments based on the constructivist pedagogy is suggested to engage learners in knowledge construction carried out by social negotiated tasks in real-world contexts while enhancing students' ability to regulate their learning (de Kock, Slegers, & Voeten, 2004).

The constructivist approach has taken a leading theoretical position and has become a powerful driving force in the dynamic relationship between teaching methods and learning processes. However, despite the growing attention paid to constructivist pedagogic challenges in the context of learning environments, the instructional principles of this theory, which are aimed at directing the nature of educational processes, still need to be clarified (Gijbels, van de Watering, Dochy, & van den Bossche, 2006).

Nonetheless, during the past two decades, attempts to map instructional constructivist principles of educational materials and learning environments have yielded a few results in the field of university teaching (Fraser, Treagust, Williamson, & Tobin, 1987; Tenenbaum, Naidu, Jegede, & Austin, 2001). For example, Tenenbaum et al. (2001) defined and empirically examined seven key features of constructivist learning environments: (1) arguments, discussions, debates, (2) conceptual conflicts and dilemmas, (3) sharing ideas with others, (4) materials and resources targeted toward solutions, (5) motivation toward reflections and concept investigation, (6) meeting students' needs, and (7) making meaning, real-life examples. However, Alt (in press) maintains that this scale could be further elaborated to include additional perceptions on a wider range of theoretical dimensions that are important to the current situation in higher education setting. For example, understanding the students' prior knowledge (Meyer, 2004); constructing environments for teaching and learning that are decompartmentalised (Minick, Stone, & Forman, 1993); and engaging students in a self-regulated learning, in which they can set their own goals, mediate new meanings from existing knowledge, and form an awareness of current knowledge structures (Hakkarainen, Lipponen & Järvelä, 2002). Therefore, constructing a new scale for measuring a wider range of constructivist features in university learning environments is central for this study.

Other scales, such as the *approaches to study inventory* (ASI) or the *approaches to learning and studying inventory* (ALSI) (Entwistle & Ramsden, 1983), and the *student process questionnaire* (R-SPQ-2F) (Biggs, Kember, & Leung, 2001), were used to measure constructivist learning by means of students' approaches to learning. These studies were based on the assumption that constructivist learning environments are aimed at fostering a deep (rather than surface) approach to learning (Lea, Stephenson, & Troy, 2003; Tiwari et al., 2006). Approaches to learning refer to how students perceive themselves going about learning in a specific learning situation, and focus on how intention and process are combined in students' deep or surface learning (Biggs et al., 2001). It has been recognised that these approaches to learning are not characteristics of learners but are determined by a relation between a learner and a context, and that students adjust their approaches to learning depending on the requirements of the task (Evans, 2014). However, the nature of learning tasks and contexts has changed dramatically in the last decade in terms of depth and range of curricula and the diversity of settings (e.g., distance learning), thus the depth of learning in constructivist environments could currently refer to diversified requirements of those



environments, pertaining to the process of 'learning to learn', learning to gain an internal control for learning, and learning how to cooperate within communities of enquiry (de Kock et al., 2004). Therefore, assessing constructivist features implementation in current higher education learning contexts is of importance and lies at the core of the present study.

Moreover, both teacher and student are assumed to be jointly responsible for the outcome, the teacher for structuring the enabling conditions, the learner for engaging them, thus an approach to learning is described as the nature of the relationship between student, context, and task (Biggs et al., 2001). However, the learning approaches scales seem to put emphasis on the learners, disregarding some significant theoretical components of learning patterns such as students' perceptions of the learning context that could affect their learning engagements (Cano & García-Berbén, 2014). In order to bridge the gap between theory and empirical study, this study will assess the relations between three learning dimensions: students' constructive learning activity perceptions, teacher-student engagements and students' social activity.

Finally, current studies have suggested that constructivist learning environments do not always promote students' deep learning, and point to several factors that limit the effectiveness of those learning settings (Baeten, Kyndt, Struyven, & Dochy, 2010; Gijbels, Segers, & Struyf, 2008; Kyndt, Dochy, & Cascallar, 2014). For example, Kyndt et al. (2014) maintain that these learning environments demand too much from the students in terms of workload and task complexity, in these cases inducing a deep approach to learning could be difficult. Based upon those studies, it seems important to detect possible relations between the learners and their social learning environment that could encourage them to become self-regulatory and support their confidence and ability to excel in complex tasks required for constructivist learning.

Hence, this mix-method study represents an effort to map features of constructivist learning environments, construct and validate a new scale for measuring facets of constructivist learning and assess their perceived implementation in several higher education learning contexts. Moreover, since previous studies have consistently link students' academic self-efficacy (Bandura, 1997) to learning settings based on the constructivist theory (Dorman & Adams, 2004; Dorman, Fisher, & Waldrip, 2006), this psychological outcome has been chosen as a criterion variable in order to further assess construct validity of the new scale. This study could detect effective constructivist practices in university learning settings and measure their connection to self-efficacy for learning. Revealing interrelations among several constructivist practices could provide practical implementations, informed by the constructivist theory, for higher education teaching practices. Finally, the potential differences between various forms of contemporary learning settings: lecture based environments, seminars and distance learning environments, and the assessment of the use of constructivist activities in these settings, will be addressed in this study. Such comparative examination could demonstrate how different constructivist activities could be applied in various settings as well as challenge the positive effect attributed to constructivist based environments on academic self-efficacy.

2. Theoretical framework

2.1 The constructivist pedagogy

Constructivism is a view of learning that perceives the individual as an active and responsible agent in his/her knowledge acquisition process (Brooks & Brooks, 1999). This view is shared by cognitive constructivism and social constructivism. However, while cognitive constructivism is concerned with the individual's construction of knowledge, social constructivism stresses the collaborative processes in



knowledge building (Windschitl, 2002). These epistemological emphases are exemplified by Bakhtin (1984, 1986). For Bakhtin (1984), meaning is a product of dialogues: "truth is not born nor is it to be found inside the head of an individual person; it is born between people collectively searching for truth, in the process of their dialogic interaction" (p. 110).

Several essential factors of the social constructivist pedagogy are indicated by theorists and practitioners (Packer & Goicoechea, 2001; Popkewitz, 1998; Steffe & Gale, 1995). These features may be grouped around three key tenets of the constructivist learning environment in line with de Kock et al.'s (2004) classification: *constructive activity*, *teacher-student interaction* and *social activity*, as further described below.

The first tenet (constructive activity) pertains to the process of 'learning to learn'. This principle is based on several educational practices. First is the idea that learning occurs during sustainable participation in inquiry practices focused on the advancement of knowledge. This process, consists of a so-called predict-observe-explain procedure (White & Gunstone, 1992) where learners hypothesise, test their hypothesis, explain observations as a way of verifying hypothesis, and later discuss discrepancies between the hypothesis and the outcome. In this format, learners' participation throughout the lesson will be through predicting, observing and explaining the learning process. In this process, learners are required to actively make meaning from information; they cannot be passive consumers of conceptualisations, analyses and conclusions of others. However, although university teaching is claimed to have a special task to support students in adopting ways of thinking and producing new knowledge anchored in scientific inquiry practices (Gellin, 2003; Resnick, 1987), Stahl (2011) argues that students' habits of learning are still overwhelmingly skewed toward passive acquisition of knowledge from authority sources rather than from collaborative inquiry activities.

Authenticity is another dimension of the constructive activity tenet. Authentic experiences allow the individual to construct mental structures that are viable in meaningful situations. Since learning is contextual, knowledge construction should occur in situations that are real rather than contrived (Dolittle & Camp, 1999). Situating learning in a real world task ensures that learning is personally interesting, and provides the students with opportunities to think at the level of sophistication they are likely to encounter in the real world (Erstad, 2011). Lahn (2011) maintains that more attention should be paid to contextual variables that provide learners with a wide range of authentic experiences, and scaffolds that support an effective reorganisation of knowledge, while conceiving learners as active designers of their learning environment.

Providing multiple perspectives and representations of a content, is another dimension of the constructive activity tenet. The constructivist learning encourages the student to examine a phenomenon from several points of view (perspectives). When students are able to examine an experience from multiple perspectives, their understanding and adaptability are increased. In this process they are forced to go beyond everyday ethical contemplation by developing dialogue and multiple perspectives as well as drawing on available resources (Lund & Hauge, 2011). This practice provides students with multiple opportunities to develop a more viable model of their learning and social experiences (Dolittle & Camp, 1999).

Another dimension of the constructive activity first tenet refers to the idea that content and skills should be understood within the framework of the learner's prior knowledge (Dochy & Alexander, 1995). Teachers should be able to ascertain their students' prior knowledge and teach accordingly. By understanding the student's mental structures, teachers can clarify incomplete or erroneous prior knowledge, determine the method of instruction necessary in a particular topic area, create effective experiences and plan independent activities, and assess materials adapted to the student (Meyer, 2004). Teachers should also create environments for teaching and learning that are decompartmentalised, by integrating individual, social and



institutional processes, as stressed by Minick et al. (1993): "...one cannot develop a viable socio-cultural conception of human development without looking carefully at the way these institutions develop, the way they are linked with one another, and the way human social life is organised within them" (p. 6). Hence, contrary to the traditional ideology of teaching and learning, which relies mainly upon learning opportunities that are the mere "spelled out" transmission of dominant knowledge, according to the new interdisciplinary approach, experiences retrieved from the past could offer mediations to decipher present experience, and lessons learned from prior inquiry could be turned towards a creative future (Perret-Clermont & Perret, 2011). This approach is considered an efficient way to help teachers and learners deal with acquiring knowledge that grows at exponential proportions within change processes (Jacobs, 1989).

The second tenet (teacher-student interaction) is one of the main conceptual pillars of the constructivist pedagogy. This principle stresses on the self-regulated learner, and on shifting the external control over the learning process, as used in conventional and well-structured learning settings, to the student's internal control for learning. In these processes, students should be encouraged to become self-regulatory, self-mediated, and self-aware (de Kock et al., 2004). Students are given opportunities to actively engage in self-regulated learning processes, including setting their own goals, mediating new meanings from existing knowledge, and forming an awareness of current knowledge structures (Hakkarainen et al., 2002). The teacher role is to engage students in a self-regulated learning, often referred to as meta-cognition (Brown, 1987), and encourage students to set their own goals while emphasising collaboration and negotiation. The teacher should also provide scaffolding during the learning process, while encouraging and guiding students to reflect on their own learning processes, rather than acting as a knowledge conduit (Järvelä, Hurme, & Järvenoja, 2011). King (2002) describes this learning as a deliberate process during which learners focus on their performance and think carefully about the thinking that led to particular actions, what happened and what they are currently learning from the experience, in order to better perform in the future.

According to the final tenet (social activity), learning is a social activity in which individual learning processes are affected by personal characteristics as well as by external social factors, and meaning is constructed from the interaction between existing knowledge and social situations (Vygotsky, 1978). This principle highlights the cooperative nature of the learning process aimed at fostering a dialogic thinking (Schwarz, 2009; Schwarz & de Groot, 2011; Wegerif, 2007). The dialogic interpretative framework implies that pedagogic practices should be able to sustain more than one perspective simultaneously. This pedagogy has been described by Wegerif and De Laat (2011) in terms of moving learners into the space of dialogue. This process includes the promotion of communities of enquiry and dialogue skills through the use of forums of alternative voices, and the induction of students into real dialogues across cultural differences. Järvelä et al. (2011) maintain that successful engagement in such collaborative and dialogic learning involves core processes of self-regulated learning, effective use of learning strategies to participate in collaborative interactions, meta-cognitive control, and regulation of motivation and emotions.

2.2 Features of constructivist learning in higher education environments

Although the conventional lecture form has been consistently associated with the traditional one-way traffic instruction, based on objectivist philosophical assumptions, Nave (1991) implies that several constructivist activities could be implemented in university lecture based settings. She distinguishes a conventional lecture from an 'open-text' lecture. In a conventional lecture, learners simply absorb new materials, without being allowed to raise questions. In contrast, an 'open-text' lecture allows the teacher to manoeuvre his/her ways from time to time, present the material from multiple points of view, and use varied



examples which are relevant to the students' world. During these activities, teachers can promote dialogic processes in the classroom. Nave (1991) maintains that this complex and challenging approach necessitates qualified teachers who have the special skills required for this 'open-text' instructional design.

Another higher education environment is the distance learning, defined as a planned activity that occurs in a different place from the teacher, far from the designated learning place, using special techniques for designing online courses (Barak & Dori, 2009). The philosophy of constructivism seems to have crucial implications for learning and instructional design in distance learning settings. In the neo-Vygotskian socio-cultural theory, technology is seen as a facilitator of dialogic spaces where students can use networks to creative learning (Wegerif & De Laat, 2011). With the rapid growth of distance learning courses, it seems worthwhile to examine how distance learning settings support the use of constructivist activities.

Additional learning environment, based on the constructivist pedagogical approach, is the research-based seminar. Seminars include intense study relating to the student's major, typically have significantly fewer students per professor than normal courses, and are generally more specific in topic of study. These settings are conceived as excellent ways by which a community of learners could be built, interdisciplinary research-based (i.e. inquiry-based) settings could be promoted, and student-centred activities, where students themselves could take a key role in creating the research/learning link, could be fostered (Lueddeke, 2003).

Despite the many theoretical appeals of comparing between traditional learning environments and constructivist based environments, few are the empirically based studies. For example, Tynjälä (1999) showed how students in a constructivist learning environment acquire more diversified knowledge when compared with students in a traditional teaching setting. However, the potential differences between various forms of contemporary learning settings and the assessment of the use of constructivist activities in these settings are yet to be explored. Such comparative examination could demonstrate how different constructivist activities could be applied in various settings.

2.3 Academic self-efficacy

An important psychological outcome addressed in previous research concerning constructivist teaching and learning, is academic self-efficacy (Bandura, 1977, 1986). Studies have stressed that academic self-efficacy is a positive predictor of academic achievement (Carroll et al., 2009), and of self-motivation for academic attainment (Bandura, 1997), therefore measuring the potential contribution of different learning environments to this psychological outcome is of importance.

Academic self-efficacy refers to personal judgements of one's ability to succeed at an academic task on a designated level or to attain a specific academic goal (Bandura, 1997; Linnenbrink & Pintrich, 2002). Accordingly, self-efficacy competence includes behavioural actions as well as the cognitive skills necessary for performance in a specific domain, and has been defined as "an individual's confidence in their ability to organise and execute a given course of action to solve a problem or accomplish a task" (Eccles & Wigfield, 2002, p. 110). According to Bandura (1997), learners with the same level of cognitive skill development could differ in their intellectual performances due to the strength of their perceived self-efficacy.

Previous studies (Dorman & Adams, 2004; Dorman et al., 2006; Loyens, Rikers, & Schmidt, 2008; van Dinther, Dochy, & Segers, 2011), link self-efficacy competence to the psychosocial learning environment that students experience in their schools and classrooms, and report a consistent contribution of the constructivist learning environment to students' academic self-efficacy. Donche, Coertjens, Van Daal, De Maeyer and Van Petegem (2014) showed how academic self-efficacy has a positive direct effect on first year



university students' deep learning engagement. Dorman and Adams (2004) suggest that the potential of the constructivist learning environment in explaining academic self-efficacy should be recognised.

2.4 The present study

This study attempts at first, mapping features of actual constructivist learning instantiations in higher education settings, second, constructing and validating a new scale for measuring those features, third, assessing the constructivist features implementation in different higher education settings, and fourth, measuring their effect on self-efficacy for learning. This study's main research questions were formulated as:

Q1. To what extent do students' perceptions of the presence of constructivist learning practices in their classes contribute to their academic self-efficacy? Which perceived constructivist practices are connected to students' academic self-efficacy?

Q2. Which learning environment sufficiently reflects an assemblage of constructivist tenets, and promotes academic self-efficacy?

Figure 1. demonstrates the theoretical structure of the proposed theoretical framework.

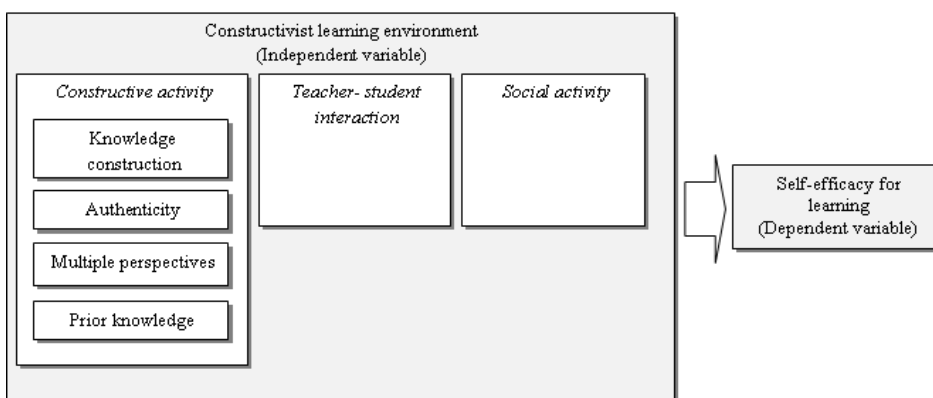


Figure 1. Model 1. The theoretical structure of the proposed framework.

3. Method

A mix qualitative and quantitative research method, applied in three phases, was used to address the research aims and questions. Creswell (2007) emphasised the superiority of a mixed-method research design in exploratory research. This method builds upon the synergy that exists between the qualitative-quantitative research continuum thus allowing to reinforce research construct validity and to expand the understanding of an explored phenomenon.

3.1 Phase 1

The first phase was aimed at gathering and analysing classroom observational activities as experienced by students, in order to learn about actual instantiations of the theoretical constructivist features. This phase used a qualitative methodology to analyse the gathered materials according to the categorical scheme suggested by theory, while allowing for additional meaningful categories identification.



3.1.1 Participants and material gathering procedure

Phase 1 included 62 undergraduate third-year students from one major college in Israel, (12.5% male students 84.6% female students). Their distribution with respect to faculties was as follows: Education- 15 students, Criminology – ten students, Sociology – 12 students, Management – four students, Economy – five students, Behavioural Sciences – eight students, Political Sciences -four students, and Communication - four students.

Participants were asked to keep observation diaries of their learning activities in one of the following courses: a seminar (SM), a lecture based environment course (LBE) or a distance learning environment course (DLE). Since the following analysis procedure involved both deductive and inductive category applications, a prescribed general format of the diary was given, and three theoretical foci were suggested to assist observations: learning activity, teacher- student interaction and social activity. There was also a self-reflection section in the diary.

3.1.2 Analysis of the study materials

In line with the deductive approach, a categorical scheme suggested by the theoretical perspective was defined (see the independent variable shown in Fig. 1). The inductive approach allowed identifying additional meaningful categories. According to Strauss (1987), both these aspects of inquiry are absolutely essential throughout the analysis. Thus, both logically derived categories and those that have "serendipitously" arisen from the data may find their way into the research (Merton, 1968).

Students' observations were analysed by four raters; all are experts in the research area of constructive learning. Inter-rater Cohen's Kappa (k) reliability (Cohen, 1960), which is commonly assessed in psychological research, was used. The raters were asked to categorise the students' observation reports according to the theoretical scheme. The k values were interpreted as follows: $k < 0.20$ poor agreement; $0.21 < k < 0.40$ fair agreement; $0.41 < k < 0.60$ moderate agreement; $0.61 < k < 0.80$ good agreement; $0.81 < k < 1.00$ very good agreement. Results of $0.61 < k < 1$ were considered acceptable for the purposes of the current study. The raters were also asked to report on new identified categories.

3.2 Phase 2: Questionnaire development

This phase was aimed at developing a questionnaire that could assess constructivist activities in various educational settings. The students' descriptions gathered in the qualitative research (Phase 1), where formulated as short items by three instructional design experts in the research area of constructive learning. For example, the following description of DLE: "Assignments were given during this course on Moodle (Modular Object-Oriented Dynamic Learning Environment). This allowed me preparing the required work when I chose to; I could progress at my own pace" was phrased as: 'In this course, the teacher considered my learning pace' (c12). Each item was given a Likert-type score ranging from 1 = *not at all true* to 5 = *completely true*. Consequently, a 41-item scale was submitted to 78 undergraduate third-year students in order to assess the clarity of the items. Accordingly, five items were excluded due to unclear phrasing. The new scale (hereinafter: Constructivist Learning in Higher Education Settings scale [CLHES]) included 36 items.

3.3 Phase 3

This quantitative phase was used to validate the developed questionnaire by using structural equation modelling (SEM) (Bentler, 2006; McDonald & Ho, 2002). In addition, since previous studies have



consistently link students' academic self-efficacy to constructivist learning settings, this psychological outcome had been chosen as a criterion variable to further assess construct validity of the new scale. Additional aim of this phase was to test the research questions.

3.3.1 *The criterion variable: Academic self-efficacy*

An eight-item (g1 – g8) scale derived from the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich, Smith, Garcia, & Mckeachie, 1993) was used to assess perceived academic competence in the students' learning environments. The MSLQ was originally designed to measure college undergraduates' motivation and self-regulated learning perception and learning strategies. The MSLQ is modular, thus allows using the sub-scales separately, as has been the case in the present study, which used only the academic self-efficacy sub-scale. All items were scored on a 5-point Likert scale with anchors of 1 = *strongly disagree* to 5 = *strongly agree*. For example, 'I'm certain I can master the skills being taught in this course.' (Cronbach's alpha = 0.89).

3.3.2 *Participants*

The CLHES and MSLQ were submitted to 597 undergraduate third-year students (15.4% males and 84.6% females) from one major college in Israel, of whom 37.5% were Jewish students and 62.5% Muslim students, with a mean age of 24.5 (SD=4.7) years. Based on the report of the Central Bureau of Statistics (2011) and the Council for Higher Education (2009) in Israel, the gender and ethnicity breakdown of Northern Galilee college students, majoring mainly in social sciences studies, is 20% males and 80% females of whom 40% Jewish, 55% Muslim, and 5% belonging to other religions, thus the current study's sample represents, to some extent, the gender and ethnicity breakdown of regional colleges located in the Northern Galilee. The distribution of the participants with respect to course settings (Course groups) was as follows: 29.1% LBE students (enrolled in three randomly selected courses), 40.2% seminar course students (SM), (enrolled in eight randomly selected courses), and 30.7% DLE students (enrolled in three randomly selected courses). The sample reflected the faculty enrollment breakdown of the campus, composed as follows: Education – 63%, Criminology – 12.8%, Sociology – 7.9%, Management - 7.5%, Economy – 4.3%, Behavioural Sciences - 2%, Political Sciences - 1.9%, and Communication – 0.6%.

3.3.3 *Procedure*

The CLHES was administered to the participants near the end of their courses - at the second semester of the third year of studies. The students were told that the purpose of the study was to examine their perceptions of the course. Prior to obtaining participants' consent it was specified that the questionnaires were anonymous and that no pressure would be applied should they choose to return the questionnaire unfilled or incomplete (the overall response rate was 87%; 34 questionnaires were excluded due to incomplete response). Finally, participants were assured that no specific identifying information about the courses would be processed. The scale items were originally generated in Hebrew, and were translated into English and back translated by professional editors for the purpose of this paper.

4. Findings

4.1 Phase 1. Qualitative study results

Table 1 presents the categories and several examples from the students' reports. In line with the theoretical framework, five categories have been recognised from the reports: *knowledge construction*,



authenticity, multiple perspectives, prior knowledge and teacher- student interaction. An additional category of *in-depth learning* has emerged from the analysis. Moreover, the theoretical category of *social activity* has been divided into two distinctive sub-categories: *social interaction* and *cooperative dialogue*, as further described below:

- 1) *Knowledge construction* is described as multiple opportunities given to students to investigate real problems, raise questions and search for possible explanations while using various methodological approaches.
- 2) *In-depth learning.* This category pertains to the extent to which students are given opportunities to deeply explore a certain subject matter, rather than engaging them in a surface learning.
- 3) *Authenticity,* deals with giving relevant meaning to the learned concepts and addressing real life and interesting events which are related to the studied topic.
- 4) *The multiple perspectives* category refers to presenting complex ideas from several points of view.
- 5) *Prior knowledge* primarily deals with connecting the subject materials to other courses' topics.
- 6) *Teacher- student interaction* refers to the teacher role which includes guidance toward reflection on learning processes.
- 7) *Social interaction* includes a variety of learning activities with other students, not necessarily during a lesson.
- 8) *Cooperative dialogue* refers to dialogical activities during the lesson in which students can express opinions and original ideas.

It can be learned from Table 1 that the pedagogical principles introduced in the theoretical framework and in the analysis were associated with various course formats. For example, the following example shows how authentic real life examples are integrated in a lecture based course: "This course, entitled 'Social Roles', deals with the family life span, especially with men's and women's roles in different societies, for example, conflict situations within the family. The examples given in class reflect real situations from our daily life."

A reversed description (RV) is a report in which students describe a lack of a constructive related activity in the learning environment, for example, the following report exemplifies how the teacher does not implement dialogical activities during a lecture based lesson: "When students want to comment on a specific issue that has been taught in class, the teacher explains that they have no right to do so, since "much better scholars than them have investigated the issue". Eventually, everyone silently obeys the teacher."

Table 1

Categories and examples from students' reports. Note: seminars (SM), lecture based environments (LBE), distance learning environments (DLE), reversed description (RV)

Category	Examples
Knowledge	▪ <i>In this course we have investigated an interesting issue related to parents'</i>



<p>construction</p>	<p><i>empowerment in educational processes, with relation to different cultural needs. This inquiry required interviewing parents; some of them were parents of children with special needs. We also interviewed educational teams in order to find ways to enrich parental involvement in schools and communities.(LBE)</i></p> <ul style="list-style-type: none"> ▪ <i>I want to explore how teenagers from different cultures experience their adolescence period. In order to find an answer to my question, I have to interview parents from different ethnic groups.(SM)</i> ▪ <i>This course involved a field work. We went to kindergartens in our city and explored how different theoretical approaches can be applied in real situations. The conclusions of our experiences were later discussed in the class.(LBE)</i> ▪ <i>Students have presented their research work in class. They have described the whole process from the start: stated their research question, described the preferred methodology, presented the data analysis, research findings and conclusions.(SM)</i>
<p>In-depth learning</p>	<ul style="list-style-type: none"> ▪ <i>This course required preparing a project regarding the skills of the school counsellor. This was really an intensive work that included a deep study of this topic. (SM)</i> ▪ <i>The teacher shows us Power Point presentations loaded with complex figures I cannot understand. He moves from one topic to another, sometimes I really get confused.(RV) (LBE)</i> ▪ <i>The main goal [of this course] is the final exam. We study in order to pass the exam. There was no enriching beyond the concepts required for the exam. We could not ask questions during classes in order to deepen our understanding, since "there is no time for questions". (RV)(LBE)</i> ▪ <i>Sometimes I get very interested in a subject raised by the teacher, at this point, disappointedly, she moves on to another subject. I feel that the quantity is much more important for her than the quality. (RV)(LBE)</i>
<p>Authenticity</p>	<ul style="list-style-type: none"> ▪ <i>The teacher uploads assignments to the course website. These assignments concern current educational issues. We are also required to search for news and to find items regarding the studied material. (DLE)</i> ▪ <i>This course, entitled 'Social Roles', deals with the family life span, especially with men's and women's roles in different societies, for example, conflict situations within the family. The examples given in class reflect real situations from our daily life. (LBE)</i> ▪ <i>One of the requirements of this course was conducting a research assignment related to problems which Arab women are confronted with when leaving their close environment sphere towards academic studies, and the obstacles they encounter when they get back to their villages to work. This is an interesting issue; I was highly motivated to take part in this investigation. (SM)</i> ▪ <i>One of the topics was the history of the Maccabiah [an international Jewish athletic event]. We have studied the subject through protocols of interviews with past athletes, newspapers articles and stories related to the history of this event.(LBE)</i>
<p>Multiple perspectives</p>	<ul style="list-style-type: none"> ▪ <i>The subject of this lesson was 'sexual assault'. Each student could present his or her attitude. Different perspectives were brought up by the students. One of them argued that women "bring it upon themselves" and should dress in a more modest manner. Others disagreed and argued that religious girls in their</i>



	<p>villages, although dressed by the religious code, were sexually abused. (LBE)</p> <ul style="list-style-type: none"> ▪ In this course we talk about different codes of norms of several religions: Jewish, Muslim, Christian and Druze. At first, every student introduced his/her tradition regarding the dressing code, then, we asked each other questions regarding for example, the origin of these codes, and the obstacles arise within a multicultural society with relation to these codes. (LBE) ▪ In this lesson we have discussed the subject of 'egalitarian division of labour within the family'. Some female students were against the idea of equal sharing, one of them argued that her husband is working hard and this is enough labour for him, and that from her point of view women should take care for domestic issues only. Other students strongly opposed this position. Maybe their different cultures effect their point of view.(LBE)
<p>Prior knowledge</p>	<ul style="list-style-type: none"> ▪ The main topic dealt with the transition to parenthood. This subject was related first, to my previous experience as a mother, and second, to many subjects such as psychology, childhood era, conflicts in the family, which I have learned during the past year.(LBE) ▪ In this lesson we learned about ethics in research. The teacher showed us videos of the Milgram's experiment on obedience to authority figures. I have learned about this experiment in a psychology related course earlier this year, however, this moral perspective has broadened my knowledge. (LBE) ▪ One of the discussed topics was on unmarried couples who choose to have a parenting agreement. This issue raised many important aspects that were related to several course materials I had previously studied, such as: parents and parenting, the child's security and needs. (LBE)
<p>Teacher-student interaction</p>	<ul style="list-style-type: none"> ▪ One of my assignments was to present a theme with relation to the studied material. The teacher encouraged me to search for papers, she has given me a general guidance on how and where to find scientific materials related to my subject.(LBE) ▪ Assignments were given during this course on Moodle (Modular Object-Oriented Dynamic Learning Environment). This allowed me preparing the required work when I chose to; I could progress at my own pace. (DLE) ▪ The teacher knows every single student by his/her name. She always encourages me. After my class presentation, she sent me an email in which she had appreciated my progress and added some comments on how to improve my learning process. (SM) ▪ In this course the assignments are given in a way which allows me to organise my schedule in a flexible manner.(DLE)
<p>Social interaction</p>	<ul style="list-style-type: none"> ▪ During this course Arab and Jewish students have cooperated on multiple occasions. For example, the Hebrew language is very difficult for non-native speakers, so in many occasions during a cooperative in -class or out-class work, Jewish students helped Arab students correcting spelling mistakes and improving oral presentations.(LBE) ▪ I have kept downloading materials from the website, nothing else was needed. I was not required to work with others, frankly, I did not know the students participating in the course .(RV)(DLE) ▪ The teacher encourages us to use the forum. She raises questions and asks us to comment and hold a debate. However, in practice, it seems that many students



	<p><i>invest their time in answering her questions, and do not pay any attention to students' comments.(RV)(DLE)</i></p>
<p>Cooperative dialogue</p>	<ul style="list-style-type: none"> ▪ <i>The discussed subject was conflict in the family with relation to the "coming out of the closet" issue. A female student shared her private experience in this context with us. People got excited, students in this class come from different cultures, some of them religious, and therefore very different voices were heard. (LBE)</i> ▪ <i>Although defined as a lecture based course, discussions were held in every lesson. For example, the Jewish ancient law of Halitza was discussed. According to this law, a Jewish widow would need to marry her brother-in-law unless he freed her in a ceremony known as Halitza. Many students wished to say something about it. Some argued that this ceremony is no longer valid even in orthodox communities. Others suggested that this is another example of an anti-feminist realty imposed by religion. Through these dialogues I have become more interested in the studied material.(LBE)</i> ▪ <i>When students want to comment on a specific issue that has been taught in class, the teacher explains that they have no right to do so, since "much better scholars than them have investigated the issue". Eventually, everyone silently obeys the teacher. (RV)(LBE)</i>

4.2 Phase 2. Descriptive statistics, internal consistency and construct validity of the CLHES

Table 2 presents the CLHES factors, sub-factors, item descriptions (as derived from Phase 2) and internal consistencies (Cronbach’s alpha). Items 10, 25, 30 were excluded from the analysis due to low item loading results (< .30) found in the structural equation modelling (Fig.2). Each of the eight factors showed a very high internal consistency.

Table 3 provides descriptive statistics for the CLHES factors (N = 597). Table 4 displays the Bivariate correlation analysis results among the CLHES factors and between these factors and the academic self-efficacy criterion variable. Convergent validity has been shown by positive statistically significant correlations between all factor pairings. Meaning, the measures of the constructivist factors that theoretically are related to each other are in fact observed to be related to each other. The generally moderate correlations among the dimensions suggest that the factors are, to some extent, independent each from the other. Finally, as can be learned from Table 4, the correlation coefficients shown between the CLHES factors and the academic self-efficacy variable are lower than the among- constructivist- factor coefficients. Therefore, discriminant validity of the CLHES scale may be confirmed. These conditions were posited by Campbell & Fiske (1959) as evidence supporting construct validity.



Table 2

The CLHES questionnaire: factors, sub-factors, item descriptions and internal consistencies (Cronbach's alpha)

Factors and sub-factors	Item	Cronbach's alpha
Constructive activity (F1) <i>Knowledge construction</i> (A1)	c1. In this course, I was given opportunities to investigate real problems	(five items) .93
	c2. During this course, I was given opportunities to raise questions about complex problems	
	c3. During this course, I was given opportunities to search for possible explanations for real problems	
	c4. I was asked to analyse data regarding a significant problem I have raised during this course	
	c5. During this course, I was asked to draw conclusions from a research work, in which I have participated	
Constructive activity (F1) <i>In-depth learning</i> (A2)	c6. In this course, I have learned skills with which I can deeply explore a subject of interest to me	(four items, item c10 was omitted due to a low loading result) .87
	c7. I could examine in depth a major issue in this course	
	c8. In this course, I have focused on a central subject which I was required to deeply understand	
	c9. In this course, I have learned how to deeply investigate a certain subject	
Constructive activity (F1) <i>Authenticity</i> (A3)	c16. This course addressed interesting situations in reality	(five items) .87
	c17. The course focused on giving relevant meaning to the learned concepts	
	c18. The course addressed real life and interesting events	
	c19. The course was rich with real-life examples that interested me	
	c20. The course did not address real life examples*	
Constructive activity (F1)	c21. In this course, ideas were presented from several points of view	(four items, item c25 was omitted due
	c22. I have learned about complex real issues in this course	



<i>Multiple perspectives (A4)</i>	c23. I have realised that the reality is complex and multi – dimensional, in this course	to a low loading result)
	c24. In this course, I had to question and criticise accepted ideas	.81
	c25. In this course, ideas were presented from only one perspective, and were not allowed to be criticised*	
<i>Constructive activity (F1)</i> <i>Prior knowledge (A5)</i>	c26. This course dealt with subjects I have learned in other courses	(four items, item c30 was omitted due to a low loading result)
	c27. The subjects learned in this course were related to prior knowledge I have gained	
	c28. Things I have learned in this course have helped me understand issues I have learned in other courses	.85
	c29. The subjects in this course were related to diverse contents of knowledge	
	c30. The subjects in this course were not related to other things I have learned in other courses*	
<i>Teacher- student interaction (F2)</i>	c11. In this course, the teacher allowed me to think about my learning and how to improve it	(five items)
	c12. In this course, the teacher considered my learning pace	.91
	c13. In this course, I could set myself some learning goals	
	c14. In this course, the teacher encouraged me to think about my learning and ways to improve it	
	c15. In this course, the teacher made me think about the advantages and disadvantages of my learning	
<i>Social activity (F3)</i> <i>Social interaction (H1)</i>	c31. This course included a variety of learning activities with other students	(three items)
	c32. I was given opportunities to learn with other students in this course	.88
	c33. I could collaborate with other students in this course	
<i>Social activity (F3)</i> <i>Cooperative dialogue (H2)</i>	c34. Arguments and discussions were held during this course	(three items)
	c35. It was possible to express original ideas in this course	.89
	c36. In this course, I could express my opinion, even when it was different from other students	

* Reversed items



Table 3

Descriptive statistics for the CLHES measured factors

Factor	Mean	SD	Skewness	Kurtosis
<i>Knowledge construction (A1)</i>	3.11	1.11	-0.31	-0.815
<i>In-depth learning (A2)</i>	3.41	0.99	-0.54	-0.26
<i>Authenticity (A3)</i>	3.59	0.86	-0.76	0.43
<i>Multiple perspectives (A4)</i>	3.41	0.79	-0.54	.40
<i>Prior knowledge (A5)</i>	3.42	0.87	-0.62	0.36
Teacher- student interaction (F2)	3.33	0.95	-0.55	-0.24
<i>Social interaction (H1)</i>	3.13	1.09	-0.35	-0.62
Cooperative dialogue (H2)	3.48	0.99	-0.63	0.02

Table 4

Bivariate correlation matrix for the eight factors of the CLHES scale and academic self-efficacy

Factors	1	2	3	4	5	6	7	8	Academic self-efficacy
1 <i>Knowledge construction (A1)</i>		.775**	.557**	.589**	.409**	.589**	.458**	.495**	.336**
2 <i>In-depth learning (A2)</i>			.604**	.623**	.497**	.663**	.501**	.465**	.364**
3 <i>Authenticity (A3)</i>				.686**	.535**	.623**	.435**	.455**	.309**
4 <i>Multiple perspectives (A4)</i>					.533**	.628**	.488**	.520**	.302**
5 <i>Prior knowledge (A5)</i>						.546**	.423**	.380**	.328**
6 Teacher- student interaction (F2)							.457**	.436**	.385**
7 <i>Social interaction (H1)</i>								.595**	.286**
8 Cooperative dialogue (H2)									.291**

$p < .01^{**}$



4.3 Phase 3

4.3.1 Testing the first research question

Structural equation modelling (SEM) was employed to test the first research question (Q1), and to further assess the construct validity of the CLHES, using a confirmatory factor analysis. Data used for the SEM were analysed with the maximum likelihood method. Three fit indices were computed in order to evaluate model fit: $\chi^2(df)$, ($p > .05$), CFI (> 0.9), and RMSEA (< 0.08).

The structural model (Fig. 2) refers to the combined measurement and path models. The measurement model includes the following factors: First, the *constructive activity* (F1) latent variable accompanied by five latent variables: *knowledge construction* (A1) with five observed items (c1 – c5); *in-depth learning* (A2) with four observed items (c6 – c9); *authenticity* (A3) with five observed items (c16 – c20); *multiple perspectives* (A4) with four observed items (c21 – c24); and *prior knowledge* (A5) with four observed items (c26 – c29); second, the *teacher- student interaction* (F2) latent variable accompanied by five observed variables (c11 – c15); third, the *social activity* (F3) latent variable accompanied by two latent variables: *social interaction* (H1) with three observed items (c31 – c33) and *cooperative dialogue* (H2) with three observed items (c34 – c36).

The path model was constructed as follows: three paths were specified between the latent factors F1 – F3 and the criterion latent variable of academic self-efficacy (SE) which was accompanied by eight observed items (g1 – g8).

The goodness of fit of the data to the model yielded to sufficient fit results ($\chi^2 = 2079.36$, $df = 766$, $p = .000$; CFI = .926; RMSEA = .054). The results showed positive low significant coefficients between the teacher- student interaction (F2) factor and the criterion variable of academic self-efficacy ($\beta = .23$, $p < .01$) and between the social activity (F3) factor and the criterion variable ($\beta = .22$, $p < .05$). An insignificant coefficient result was indicated between the constructive activity (F1) factor and the dependent variable. As shown in Fig. 2, the CLHES factors together explained 36% of the academic self-efficacy criterion variable variance.

4.3.2 Testing the second research question

In order to test the second research question (Q2), a multivariate analysis of covariance (MANCOVA) with Bonferroni pair-wise comparisons and Wilks' Lambda criterion was applied to allow the characterisation of differences between the Course groups (LBE, SM and DLE) in regard to a linear combination of the multiple eight dependent factors of the CLHES. In addition, an analysis of covariance (ANCOVA) with Bonferroni pair-wise comparisons was used to assess between- Course group differences on the academic self-efficacy variable. The variables of gender (1 = male, 2 = female) and cultural group (1 = Jewish, 2= Muslim) were entered as covariates to neutralise any significant confounding effect in the analyses of variance. Table 5 shows the mean scores, standard deviations, F values, Wilks' Lambda and partial Eta-squared statistics of the analyses.

Results indicated significant differences between the Course groups regarding the combination of the multiple CLHES factors and separately on each of them. All the between- group differences were accompanied by moderate to large effect sizes, when small, moderate, and large effects are reflected in values of η^2 equal to .0099, .0588, and .1379, respectively (Cohen, 1969, pp. 278–280; Richardson, 2011, p. 142).

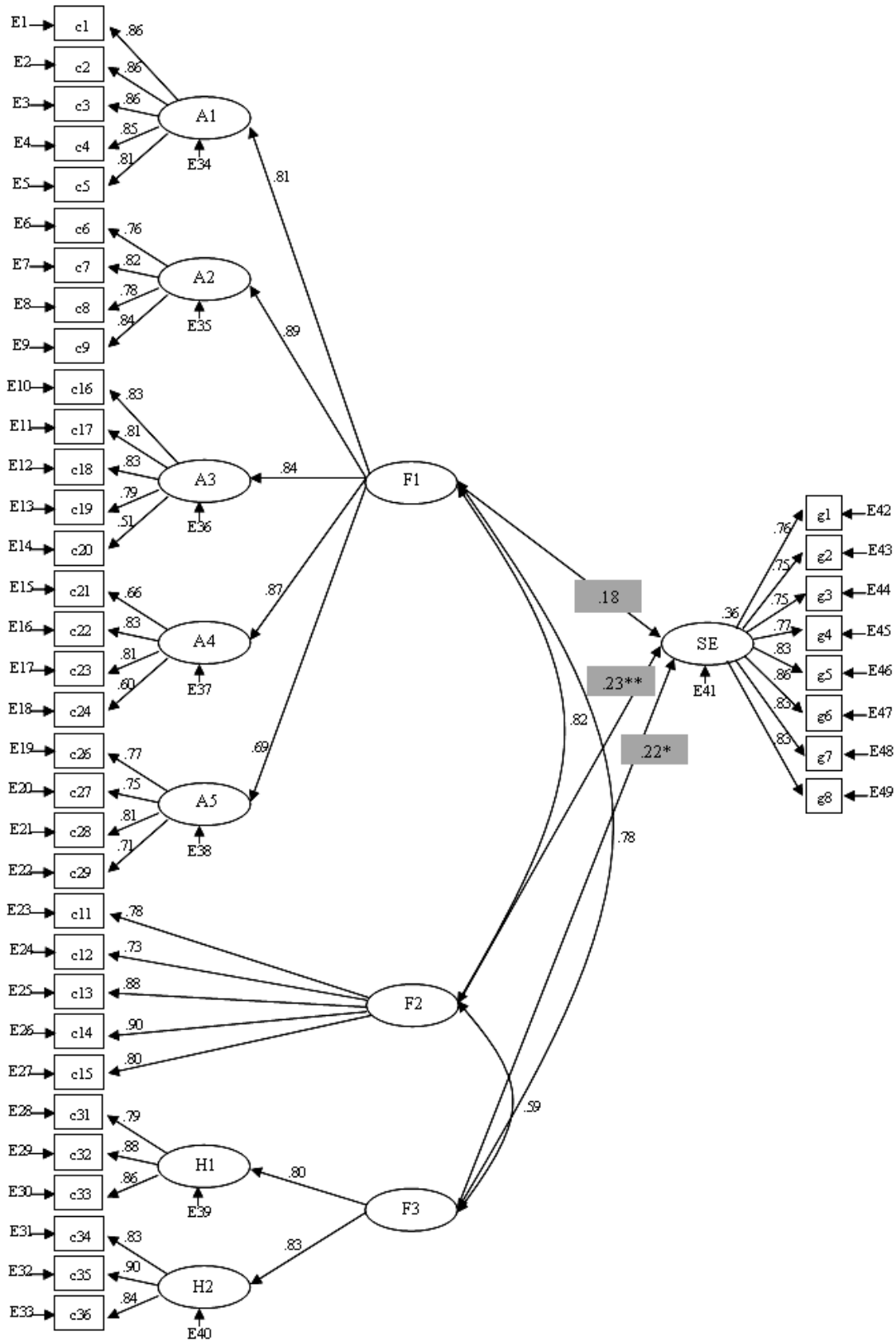




Figure 2. The structural model, with standardised parameter estimates ($N= 597$). Note: $*p < .05$ $**p < .01$ $***p < .001$.

Table 5

Mean scores, SD, F values, Wilks' Lambda, partial Eta-squared statistics (η_p^2) and Bonferroni pair-wise comparisons of the three Course groups (LBE, SM and DLE) on the eight CLHES factors and the academic self-efficacy variable. The numbers of the pair-wise comparisons indicate: 1=the lowest mean result, 2= in between, 3= the highest mean result, identical numbers indicate insignificant between-group differences.

Dependent variables	Course Groups						F	η_p^2
	SM		DLE		LBE			
	M	SD	M	SD	M	SD		
Factors of the CLHES scale							27.90***	.277
Wilks' Lambda statistic								
(Main effect)								
ANOVA								
Knowledge construction (A1)	3.87	0.70	2.99	0.99	2.20	0.90	183.75***	.384
Pair-wise comparisons		3		2		1		
In-depth learning (A2)	3.98	0.65	3.35	0.90	2.68	0.97	115.10***	.281
Pair-wise comparisons		3		2		1		
Authenticity (A3)	3.95	0.66	3.40	0.74	3.27	1.00	40.56***	.121
Pair-wise comparisons		3		1		1		
Multiple perspectives (A4)	3.71	0.67	3.35	0.71	3.06	0.87	34.06***	.104
Pair-wise comparisons		3		2		1		
Prior knowledge (A5)	3.68	0.73	3.43	0.83	3.04	0.95	24.92***	.078
Pair-wise comparisons		3		2		1		
Teacher- student interaction (F2)	3.72	0.79	3.32	0.83	2.83	1.01	45.06***	.133
Pair-wise comparisons		3		2		1		
Social interaction (H1)	3.38	1.04	3.41	0.94	2.49	1.04	39.40***	.118



Pair-wise comparisons	3		3		1			
Cooperative dialogue (H2)	3.82	0.81	3.32	0.99	3.18	1.08	24.91***	.078
Pair-wise comparisons	3		1		1			
Covariate effect								
Gender								.020
Cultural group								.067
Academic self-efficacy	4.07	0.04	3.90	.05	3.76	0.05	10.69***	.035
Pair-wise comparisons	3		3		1			
Covariate effect								
Gender								.000
Cultural group								.020

Note: $p < .05$ * $p < .01$ ** $p < .001$ ***

As presented in Table 5, salient between- group differences were indicated for the factors: *knowledge construction* (A1) ($\eta^2 = .384$) and *in-depth learning* (A2) ($\eta^2 = .281$). On each factor, the lowest mean result was indicated for the LBE group and the highest for the SM group.

Somewhat lower effect sizes were found for three factors: *teacher- student interaction* (F2) ($\eta^2 = .133$) - the lowest mean result was indicated for the LBE group and the highest for the SM group; *authenticity* (A3) ($\eta^2 = .121$), with a significant higher score shown for the SM group compared with the other groups; and *social interaction* (H1) ($\eta^2 = .118$) - the lowest mean result was indicated for the LBE group and the highest results were shown for the SM and DLE groups.

The relatively lowest effect sizes were found for three factors: *multiple perspectives* (A4) ($\eta^2 = .104$), *prior knowledge* (A5) ($\eta^2 = .078$), on each factor, the lowest mean result was indicated for the LBE group and the highest for the SM group; and *cooperative dialogue* (H2) ($\eta^2 = .078$) with a significant higher score indicated for the SM group compared with the other groups.

Regarding the academic self-efficacy variable, differences were found between the three groups, accompanied by a low effect size ($\eta^2 = .035$) - the highest results were indicated for the SM and DLE groups and the lowest for the LBE group.



5. Discussion

The overarching goals of this study were to map features of constructivist learning environments, construct and validate a new scale for measuring the presence of those features in different higher education settings, by using a mix-method approach.

5.1 The qualitative analysis

Consistent with previous theoretical research (de Kock et al., 2004) this research revealed three key tenets of the constructivist learning environment: *constructive activity*, *teacher-student interaction* and *social activity*. Regarding the constructive activity tenet, the results foregrounded five categories: *knowledge construction*, *authenticity*, *multiple perspectives*, *prior knowledge*, and *in-depth learning*. This research elaborates the body of literature by adding the sub-category of *in-depth learning* which emerged from the content analysis. This facet pertains to the extent to which students are given opportunities to deeply explore a certain subject matter, in order to seek a clearer understanding of the learning materials, in contrast to surface learning which is confined to rote learning and memorising facts. Although in-depth learning is not a new concept, this research has empirically demonstrated its relation to constructive activities in higher education settings.

Moreover, the theoretical category of *social activity* has been divided into two distinctive facets: *cooperative dialogue* and *social interaction*. Social interaction includes a variety of learning activities with other students, not necessarily during a lesson, whereas cooperative dialogue refers to dialogical activities during the lesson in which students can express opinions and original ideas.

Another finding regarding the qualitative research was that some constructivist pedagogical principles are associated with lecture based courses. For example, according to the students' reports, teachers of lecture based courses have used real-life examples during their lectures. Some students reported on dialogical activities during lectures in which students could express opinions and original ideas. These findings were partially corroborated by the quantitative analysis results according to which, LBE and DLE were perceived by the students to be equally consistent with the authenticity and cooperative dialogue constructivist features. Although, the quantitative analyses have revealed that LBE are generally less consistent with other examined constructivist features compared with SM and DLE formats, these findings may imply that some constructivist features can be applied in lecture based environments, in accordance with Nave (1991).

5.2 The quantitative analysis phase – perceptions of the learning environments

The main result of this phase showed that students perceive SM learning environments as more constructivist when compared with perceptions held by other course groups (LBE and DLE). Since SM settings are conceived as excellent ways by which constructivist activities could be fostered (Lueddeke, 2003), this finding could have been expected, and thus could further validate the new scale.

Additional findings showed that DLE are generally perceived as more constructivist than LBE, and less constructivist when compared with SM environments. However, no differences were shown between DLE and LBE in *authenticity* and *cooperative dialogue* activities. Although technology is seen as a facilitator of dialogic spaces (Wegerif & De Laat, 2011), according to this research findings, it may be inferred that this practice is inadequately applied by teachers. Researchers (e.g., Östlund, 2008) argue that guaranteeing collaboration for learning can be difficult to achieve in DLE. In order to achieve this goal,



learners should be encouraged to use the forum, and teachers should stimulate interaction by creating assignments in which the learners can be actively engaged in discussion. Nonetheless, the factor social interaction, which includes a variety of learning activities with other students, was similarly applied in DLE and SM, compared with LBE. This could suggest that students of DLE courses tend to be more engaged in off-line cooperative activities than during 'on-line' dialogues.

5.3 The quantitative analysis phase - academic self-efficacy and perceptions of the learning environments

Additional important findings regard the criterion variable of academic self-efficacy. This study's empirical model indicates that stimulating meta-cognitive and reflective aspects of learning, through teacher-student interaction, could bolster the students' confidence in their ability to accomplish a task. Studies indicate that students who develop strong academic self-efficacy beliefs are better able to manage their learning, and consequently are more likely to successfully complete their education and be better equipped for a variety of occupational options in today's competitive society (Bandura, Barbaranelli, Caprara, & Pastorelli, 2001). Accordingly, this study suggests that educators should be aware of the importance of pursuing this affective outcome by motivating the students to think reflectively, regarding the individuals' learning process. Through this process of evaluating their own performance as learners, students could become active participants in their development (King, 2002), and consequentially, as suggested by this study, more confident in their ability to execute assignments.

The *social activity* factor was found to be the second positive predictor of academic self-efficacy. This factor deals with the need to encourage interaction and collaboration among students. Interaction is perceived to be one of the most important components of the learning experience, in which students are given sufficient opportunities to express themselves and to share their own experiences with others (Dewey, 1938; Tenenbaum et al., 2001; Vygotsky, 1978). A recent study shows that effective cooperative learning communities support knowledge acquisition (Wyatt et al., 2010). The present research indicates that social interaction could also benefit academic self-efficacy. A plausible explanation could be that interactions with others allow the learners to reflect on their own work and to make independent use of their results thus being able to perform more effectively as suggested by Vygotsky (1978) and Bandura (1986). Moreover, encouraging interaction and collaboration among students could have provided sufficient opportunities for students to observe other group members. Such vicarious experience could be gained in collaborative assignments provided by the learning environment, and could affect students' perceptions of their own ability to perform (Bandura, 1997). Moreover, students who worked together could have been encouraged to share their views and evaluations of other students in their group. Having them identify the strengths of others, rather than their weaknesses, might have benefited their self-efficacy beliefs (Schunk & Miller, 2002). The present study stresses the importance of facilitating cooperative tutorial study groups not only in order to create a well-functioning environment, but also to nurture self-efficacious learners in higher education studies.

It should be noted that according to this study's result, both SM and DLE courses were more positively associated with increased self-efficacy for learning compared with LBE courses. This result could be theoretically explained by the firm contribution attributed to the philosophy of constructivism to learning and instructional design in distance learning settings and research-based seminar (Lueddeke, 2003; Wegerif & De Laat, 2011). Empirically, this result could be explained by the SM and DLE emphasis on interpersonal interactions compared with the LBE courses, according to the participants' report.



Lastly, the factor *constructive activity* was not found to be significantly connected to the self-efficacy dependent variable. It could be inferred that the social interaction dimensions of the learning environments are more prominent in explaining self-efficacy for learning. Nonetheless, the positive high connections found between the three tenets of *constructive activity*, *teacher-student interaction* and *social activity* could suggest an indirect connection between constructive activities and academic self-efficacy through increased interpersonal interactions.

5.4 Limitations and directions for future research

First limitation is that the CLHES scale constructed and validated in this study could be further elaborated. For example, this scale did not include characteristics of assessment as components of the constructivist learning environment. Assessment is considered part of the fabric of classrooms to which students attach importance. Assessment tasks that do not match student learning could lower the confidence of students for successfully performing academic tasks (Dorman et al., 2006). Thus further research is needed to examine this mediator measure with relation to higher education.



Second, future research should also consider expanding the model tested here with additional variables that could be related to learning activities such as, academic motivation psychological variables. These variables could be related to learning setting perceptions and academic self-efficacy, therefore assessing them in conjunction with the present study examined constructs is of importance and could allow measuring additional constructivist environments' effects on psychological constructs.

Third limitation concerns the cross-sectional nature of the data which can prevent definitive statements about causality. Definitive proof of mediation will also require longitudinal data (Cole & Maxwell, 2003). It should be further acknowledged that alternate models might explain the relationships in these data as well as the one tested in this study. In fact, many relationships in the model are likely reciprocal. For example, although the analysis implies that the self-efficacy construct is mainly informed by the teacher-student interaction factor, it is equally plausible that teachers may become more involved with self-efficacious students. Despite such possibilities, the path model could represent a reasonable, theoretically grounded structure of the relations between the examined factors. However, researchers should extend this work with longitudinal paradigms.




Lastly, this study was conducted in a single country, meaning that the results cannot necessarily be generalised. Therefore, larger population studies are needed to validate these findings, and more research on this topic needs to be undertaken before the associations between the perceived learning environment and self-efficacy belief are more clearly understood.

Despite its limitations, this study underscores the importance of interpersonal relationships to students' psychological outcomes, specifically, the significant roles of teacher-student- and student-student-relationships in enhancing academic self –efficacy are recognised in this study.

Keypoints

-  A qualitative analysis of classroom observational activities has foregrounded eight factors: 'knowledge construction', 'authenticity', 'multiple perspectives', 'prior knowledge', 'in-depth learning', 'teacher- student interaction', 'social interaction' and 'cooperative dialogue'.
-  Based on the qualitative analysis results, the Constructivist Learning in Higher Education Settings scale [CLHES] was developed.



-  Construct validity of the CLHES was confirmed by using structural equation modelling.
-  Teacher-student interactions and student-student social activities were positively connected to self-efficacy for learning.
-  Seminars (SM) were perceived as generally more constructivist when compared with lecture based environments (LBE) and distance learning environments (DLE).

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