A Conceptual Framework for the Development of Argumentation Skills Using CSCL in a Graduate Students' Research Course

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Abstract. Developing and presenting a well-formulated research argument is core to the learning journey of a graduate student. In open distance e-learning, computer-supported learning is instrumental in providing a platform for graduate students to develop their argumentation skills. However, there is little guidance on the elements required in using computer supportive collaborative learning (CSCL) to augment argumentation skills development (ASD). This paper reports on elements identified in literature that should be present in a framework using CSCL to augment ASD. The thematically analysed data gathered during the focus group sessions were used to confirm the structure of the argumentation skills development framework (ASDF), and confirmed that there is a need for a framework to provide guidance in using CSCL to augment ASD. The contribution includes the conceptual ASDF using CSCL, comprising seven elements, that provides a strategy of scaffolded learning for implementation in a graduate course to augment ASD.

Keywords: Learning · Collaboration · Computer support ·
Argumentation skills · ODeL · CSCL · Scaffolded learning ·
Argumentation skills development

1 Introduction

Argumentation skill is seen as a derivative that develops along the academic route and involves the understanding, managing and formulation of arguments [1] and is of interest to education as it contributes to the individual in "transforming, clarifying, changing ideas, personal growth and identifying of information" [2, p. 50]. The inclusion of the theoretical concepts of argumentation in a graduate course, along with the skills of writing academically, is not new and positive results has been reported in that the "students were able ... to produce academic texts argumentatively more sophisticated" [3, p. 139]. We refer in this study to graduate students as students that have completed their undergraduate qualification and are now enrolled for an honours' qualification.

In open distance e-learning (ODeL) it often takes considerable time for a graduate student to develop argumentation skills and demonstrate it successfully in research outputs [3] as the student is often isolated from both peers and supervisors [4]. The use of technologies available in CSCL platforms are imperative in education [5] and allow students in ODeL to not only join in online discussions, but also to augment their argumentation skills. One of the perceived advantages of using CSCL in graduate studies, is the "ability to overcome obstacles of distance and time" [6, p. 272]. However, the availability of technology and applicable platforms are not sufficient conditions to ensure that it will be utilised by graduate students to critically engage on the available collaboration platforms in academic argumentation and consequently develop their argumentation skills [7,8]. In a study by Van Biljon et al. [9], it was noted that graduate students, even in a cohort supervision environment with guidance from supervisors, are reluctant to use the available collaboration platforms to critically engage in argumentation with their peers.

The University of South Africa (UNISA) an ODeL institution, [10], is progressively using CSCL to provide various solutions and platforms for collaboration. An example of using CSCL, that is grounded in the Grasp of Evidence (GoE) framework, is the platform presented by Mochizuki et al. [11]. The GoE framework posits five dimensions of evidence evaluation, i.e. evidence analysis, evidence evaluation, evidence interpretation, evidence integration and evidence credibility. The platform, presented by Mochizuki et al. [11], allows users to collaboratively share and read multiple documents, synthesize the contents and resolve disagreements, using the scaffolded environment provided in the CSCL.

Though various research exists in the multidisciplinary field of using CSCL [12], the elements required for a conceptual CSCL framework that will augment argumentation skills in ODeL environment, could not be found. Furthermore, the researchers could not find evidence-based guidance on the elements required in a framework, purposefully designed for the augmenting of argumentation skills using CSCL, that can be implemented in a graduate course. This was also identified as a need by Järvelä and Rosé [13, p. 146] that more empirical research is required on the "design of the technological settings for collaboration and how people learn in the context of collaborative activity".

It is against this background, and with a realisation of the complexity of learning interactions in CSCL between graduate students and supervisor, as e-moderator, that the research question was formulated as: *What are the key elements required in a CSCL conceptual framework that could contribute to the development of argumentation skills in a graduate course?* In response to the research question, the researchers developed and presented an evidence based conceptual argumentation skills development framework (ASDF) to experts in focus groups consisting of supervisors with experience in postgraduate supervision and ODeL courseware developers. Evaluation by students and the institution fall outside the scope of this study, as we believe it is important to develop a mature and robust platform before involving the students in future research.

The remainder of this paper is structured as follows: In Sect. 2 the theoretical framework that underpins the development of the ASDF, based on the concept of community of practice as presented by Wenger [14] is discussed. The proposed ASDF is presented and described in Sect. 3. In Sect. 4 a scaffolded learning approach is proposed for the ASDF and Toulmin's argumentation model [2,15] is used to augment argumentation skills development. Toulmin's model or method has been used in various studies to augment the development of argumentation skills of students [2,3,16] and is discussed in more detail in Sect. 5. The method of selecting the participants, the qualitative thematic analysis process followed in transcribing the data is explained in Sect. 6. The revised ASDF, based on the findings, is presented in Sect. 7, and the paper concludes with the conclusions, limitations and future studies recommendations.

The rationale of this study then was to develop an ASDF that can be followed when implementing an argumentation model in a graduate course using CSCL. At the practical level, the research contributes to the body of knowledge by providing a framework that provides a philosophy and strategy of scaffolded procedures and techniques to implemented in a course using CSCL that augment the argumentation skills development of the graduate student. At a theoretical level, the research contributes to the body of knowledge pertaining to scaffolded approaches that can be applied in graduate courses towards the development of argumentation skills.

2   Theoretical Framework

The theoretical framework that underpins the development of the ASDF is the community of practice concept by Wenger [14,17]. For a community of practice to exist, the three elements that comprised the theory, 'the domain', 'the community' and 'the practice', need to be develop in parallel to cultivate such a community [17]. The domain element points to a community of practice that is characterised by the participation and commitment of the members towards a collaborative goal. The participants are identified by contributing to the collaborative goal through meaning and identity [14]. We refer to meaning as the way the participants will share their experience of life and the world and how it has brought about change, and identity refers to the way the participants will share how learning changed them in the context of the community.

The second element, the community, refers to the engagement among the participants, through which information and knowledge is shared and relationships are built in order to learn from one another [17]. The practice, the third element, refers to the sharing of resources. The participants build libraries of resources and find ways in which to address problems that may occur periodically [17].

In the evaluation of the ASDF, the community of practice among supervisors and course developers is significant, as it allows amongst others an increased sense of community, the sharing of years of experience, construction of knowledge and experience and critical thinking [18].

3 Proposed ASDF

Universities are adopting learning management systems (LMS) that provide collaboration platforms, using CSCL [19], that allows scaffolding learning and environments that can foster higher order thinking and critical thinking skills [20]. From a pedagogical perspective, the pedagogical approach and course requirements should drive the initiative in the development of the ASDF, and not the technology [21]. Furthermore, the ODeL technology infrastructure should provide the environment that is not only user-friendly, customisable, student centred but also provide the required privacy and anonymity [20]. Within the ODeL technology infrastructure, the affordances of collaborative tasks, ways to communicate using communication technologies, sharing of resources are of importance [22]. The learning approach followed should allow for productive processes, following strategies that allow scaffolded collaborative learning processes [22–24].
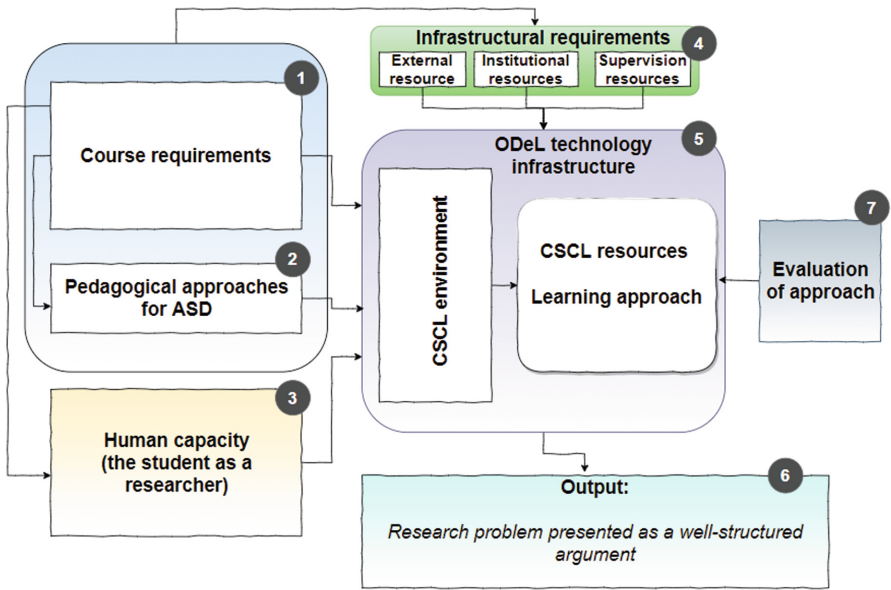

Fig. 1. Conceptual argumentation skills developments framework (ASDF)

A conceptual ASDF, seen in Fig. 1, was presented to the focus groups. The conceptual ASDF comprises seven elements, that include the elements of course requirements, the pedagogical approaches, infrastructural requirements and ODeL technology infrastructure as identified in literature as well as the elements of human capacity from the perspective of the student as a researcher, the output as a well-structured research problem and the evaluation of the approach. These elements will be explored in the next paragraphs in context of a specific honours research course.

3.1   Course Requirements

In this study, one of the honours research courses (HRCOS82), offered at UNISA, is chosen. HRCOS82 serves as a fundamental building block in equipping students with the knowledge and competencies to conduct research in the computing field, as well as giving the students the opportunity to conduct a small research project under the supervision of a lecturing team in Computing. Students enrolled for HRCOS82 choose between a selection of research projects, a project based on their area of study, which we refer to as HRCOS82 P19 in study.

Embedded in the course outcomes are the South African Qualifications Authority[1] (SAQA) critical course field outcomes (CCFO). The CCFOs are of importance as they identify key terminology that is required when building an argument and include terminology such as identifying, working, organising, collecting, communicating, use of technology, demonstrating and contributing.

3.2   Pedagogical Approaches for ASD

Collaborative learning is seen as a pedagogy that can be adopted in most learning environments, including CSCL in ODeL [25]. Furthermore, scaffolded learning activities in collaborative learning can be used to enhance argumentation skills development among students [16,26]. The course developer should take cognisance of the technology available in the ODeL environment [27] that can be used to provide a scaffolded learning journey to assist in the development of argumentation skills.

3.3   Human Capacity: The Student as a Researcher

The student in HRCOS82 P19, contributes by applying and using their competencies and contributions towards the collaborative goal.

3.4   Infrastructural Requirements

The infrastructural requirements include the resources that are required to implement the CSCL in an ODeL environment. These resources include the external resources, institutional resources and supervision resources and can be accessed and used by the community. The external resources include the adoption of cloud computing services that include open education recourses (OER), MOOCS and open data resources, as well as the use of popular multimedia platforms for communication and collaboration [28]. The inclusion of external resources is often left to the lecturer or supervisor [29]. From the student side, access to these external resources is dependent on accessibility, availability, and in some instances are device dependent. From the institution side, a need for

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[1] https://www.saqa.org.za/.

policies that will govern privacy, security and ethics together with cost and scalability are important factors that should be considered [30,31].

Institutional resources include access to resources that the university provides to students as part of their enrolment and include the university's online library, reference management software, statistical analysis software, webinars, academic integrity and similarity tools, to name a few. As these resources are part of the institution, the governance thereof is the responsibility of the institution. The supervisor, is appointed by the department within the university and the course requirements determine the qualification and capacity of the supervisor. Through institutional university resources, training in supervision and capacity development programmes are provided.

3.5   ODeL Technology Infrastructure

At UNISA, ODeL is delivered through an online LMS. The LMS provides the technology infrastructure [20] for CSCL resources and includes, among others, the structure for the learning path, e-tivities, assessment and learning approach. CSCL affordances [22] and should include the establishing of a joint task, space for online communication and sharing of resources, online interface for engaging in productive processes, and online technology tools for co-construction towards solving a shared problem. In the development of a course using CSCL, the course developers and e-moderator should keep it mind that, although students have access to technology through the internet, the students "lack the necessary skills and competence to engage fully and efficiently in online learning" [32, p. 18].

3.6   Output

The course requirements define the outcomes for HRCOS82, which in this instance is "...mastering scientific writing, literature references and can complete an acceptable written research report". In this study, following the scaffolded learning journey approach within CSCL and applying the argumentation model of Toulmin [15], the output will be "the presentation of a well formulated argument". The students will submit their final report for assessment, which is externally examined by a panel of examiners. For future studies, the method to evaluate argumentation skills from argumentation records [33] can be considered.

3.7   Evaluation of the Approach

The evaluation of the approach following in this study includes learning analytics, gathering of data through questionnaires and expert focus groups. To monitor the students' progress, learning analytics and data will be gathered over the learning journey regarding the elements of the community of practice: 'the domain', 'the community' and 'the practice' [17]. The evaluation of an implemented ASDF, through learning analytics and questionnaires among students, does not fall within the scope of this study and is considered for further research. The qualitative thematic analysis process followed in the evaluation of the proposed ASDF with experts in focus groups is discussed in Sect. 6.

4   The Scaffolded Learning Journey

Scaffolded learning refers to the use of a variety of activities in a learning journey that will assist the students in progressing towards a stronger understanding and ultimately to independence in the learning process [26, 34]. In CSCL, a scaffolded learning journey, as presented by Salmon et al. [24] is made up of activities (e-tivities) that promote "active and interactive online learning" and include sharing of resources, online discussions relating to the research, collaborating in the CSCL environment through writing messages, attending webinars and presenting research. The student starts with little or low level of competence in argumentation skills and progresses to a place where a well-formulated argument can be presented. The participants, e-moderator and other students as peers, provide support and transfer of information in a scaffolded manner as the level of challenge and the level of competence grows [34]. Refer to Fig. 2 for a presentation of this scaffolded learning journey.
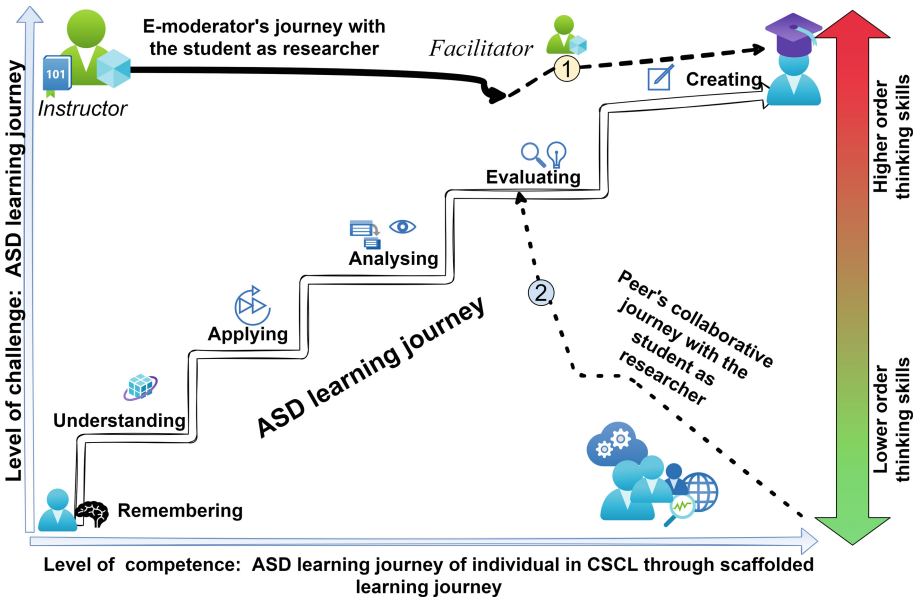

Fig. 2. ASD through a scaffolded learning journey

The level of competence of the student is mapped on the horizontal axis and represents the learning journey of the individual, and the vertical axis represents the increase in the level of competencies as the student progresses. The e-moderator, as the supervisor, facilitates the learning journey by establishing the group, introducing the knowledge domain and the learning approach as well as inducting the students into the ASD learning environment [23, 24]. In the scaffolded learning journey, the role of the e-moderator changes as the student

progresses in the learning journey. Initially starting as an instructor, the supervisor provides the required training and instruction in using Toulmin's model by identifying the various elements of claim, grounds, and so forth. As the student progresses in the learning journey, the role of the instructor gradually changes to that of a facilitator (dotted line 1) by allowing the students to build their competencies in developing argumentation skills from a low level of competence to a place where the student can create and present a well-formulated argument. Each stage requires the student to master argumentation skills in the scaffolded learning journey. The scaffolded levels of skills are presented in the categories of the revised version of Bloom's taxonomy [35], and include competencies from remembering and understanding, to applying and analysis, and finally to the categories of evaluating, creating and implementing.

In this scaffolded learning journey, the students (as peers) are part of discussion groups and have the opportunity not only to present their arguments, but also give and receive critique. The peers, travelling on the same learning journey as the individual student, collaborate in the space provided in the LMS. This is done through sharing, presenting, evaluating, critiquing, and applying the terminology of Toulmin's model (presented in the dotted line labelled 2).

Using the technology available in CSCL, allows students to collaborate at their own convenience, however, the e-moderator should monitor the collaboration as responses to discussions may appear in a disjunctive way, making engagement in in-depth discussions difficult [36]. This is of importance, as the storyboard that will be designed for the implementation of the ASDF in a research course should provide guidelines on the e-tivities and the commitments from the students to ensure that argumentation skills development is reached. Refer to Table 1 for an example of a storyboard that represents the CSCL affordances, the needs that should be addressed and design strategies with examples of e-tivities that can be used.

5   Toulmin's Argumentation Model

Toulmin's argumentation model was chosen as the argumentation model to follow in this study. The model is a style of argumentation that breaks the argument into six components, namely claim, grounds, warrant, qualifier, rebuttal and backing, as seen in Fig. 3.

Within this argumentation model, every argument has three fundamental parts which are the claim, the grounds and the warrant. The claim is the main argument and represents the assertion that the author would like to convince or prove to the audience. The grounds of an argument are the evidence and facts that support the claim. The warrant, which is often not stated explicitly, but should be part of the argument, are the assumptions that link the grounds to the claim. The backing, qualifier and rebuttal are not always present in an argument but are often required to assist the author to add nuance to the argument. The backing refers to any additional support of the warrant. The qualifier limits the study to a specific content, time or making the reader aware that the claim may

Table 1. Storyboard: CSLC Affordances Map to the Needs, Design Strategies and E-Tivities.

CSCL affordances [22]	Needs addressed	Design strategies	E-tivities
1. Establishing a joint task	Joint project is presented to the group. Instructions on how to use internal and external resources.	Students are presented with a task that is outside their area of confidence.	Using LMS collaboration spaces. Toulmin explained to in webinar. Searching and downloading of articles. Sharing work in collaboration space. Assessing in the online space.
2. Communication	Group communicate using the LMS.	Using the communication platform and applications available in LMS. Timeous feedback.	Using chats, webinars, threaded discussions available in LMS. Presenting work to the group.
3. Sharing resources	Group shares resources (internal and external).	Sharing of relevant links, channels and resources.	Identifying and utilizing data repositories, websites, referencing tools and software. Accessing and using online library.
4. Engaging in productive processes	Scaffolded learning journey, taking into account prerequisites, focus on the development of argumentation skills.	Tasks are structured and students have to perform specific tasks in the group. Timeous feedback.	Continuing peer assessment by applying argumentation tools.
5. Engaging in co-construction	Co-construction by providing input and feedback. Presentation of work.	Keeping the shared goals and problems in context. Using elements of Toulmin to critique. Timeous feedback.	Presenting research in a webinar. Peer's critique by applying argumentation elements.
6. Monitoring and regulation	Evaluation of approach.	Self-evaluation, group evaluation. Group evaluation. Data analytics.	Self-evaluation by individual student. Learning analytics by the e-moderator. Evaluating the approach within the group.
7. Finding and building groups and communities	Space provided in the LMS for students to join in communities with similar interests. Create awareness of external resources.	Through a scaffolded learning path, the student identify relevant communities and use applicable resources.	Identifying relevant communities that have similar interests.

not be true in all circumstances. Finally, the rebuttal, which is either implied or stated explicitly, acknowledges other views of similar studies. Table 2 presents a practical example illustrating the different elements in a Toulmin argument.

Table 2. Example of identifying elements of toulmin's argumentation model as part of annotation of literature

Elements of toulmin's model	
Claim	Graduate students have a problem with argumentation in research.
Grounds	Own experience. Other supervisors. Literature.
Warrant(s)	Assuming that graduate students will need to use argumentation skills to present their argument in the final report.
Backing(s)	Based on last three years of research projects. Literature identified it as problem area.
Rebuttal(s)	Alternative research on addressing argumentation skills development. English literacy contributing to poor academic argumentation. E-skills are not what it should be. Students level of the course content not sufficient.
Qualifier/Modality	ODeL. Graduate research. Computing
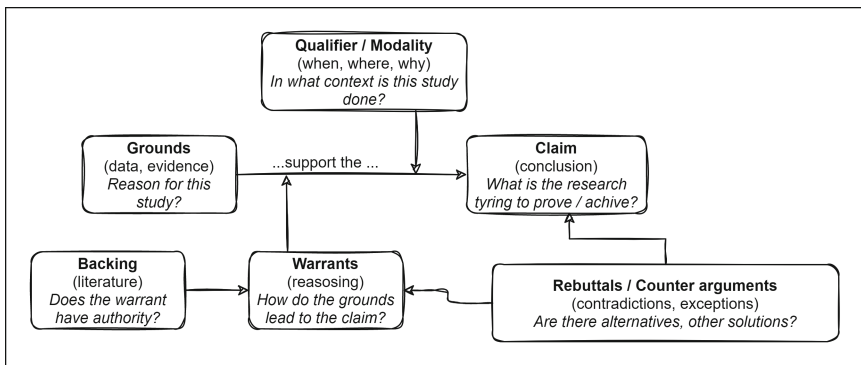
Fig. 3. Toulmin's model of argumentation

6   The Focus Groups

Ethical clearance was received and by means of purposive sampling and snowball sampling, the researchers contacted 20 potential participants. Ten of the 20 participants agreed to participate in a focus group and nominated 15 more experts to contact, of which 10 accepted. In total, 19 expert university researchers that have experience in postgraduate supervision and one ODeL curriculum designer formed part of the focus groups. These supervisors are from universities in South Africa and responsible for postgraduate supervision in different subject disciplines. Although the experts varied in their years of postgraduate supervision, the participants all had experience in either ODeL, distance education or blended learning. Furthermore, due to the COVID-19 pandemic, more traditional residential universities in South Africa relied on e-learning environments to engage with their graduate students and could relate to the online learning environment

as presented in this study. Nine focus group sessions were held via MS Teams. The number of participants varied between one and three experts in a focus group.

The following question guided the discussions in the focus groups: *What are the key elements required in a CSCL conceptual framework that could contribute to the development of argumentation skills in a graduate research course?* A summary of the research study and copies of the screens presented during the focus groups were distributed in advance to the participants. Each focus group lasted an hour. During the first 20 min, the purpose of the focus group was explained and the ASDF presented. During the remainder of the session, the participants engaged in discussions and completed an online questionnaire. In Sect. 6.1 the findings are discussed in terms of themes that emerged from the discussions and in Sect. 6.2 the online questionnaires completed by the participants are discussed.

6.1   Focus Group Discussion Findings

The themes that emerged from the thematic analysis process were identified and labelled as *ASDF*, *argumentation model*, *infrastructural requirements*, *collaboration* and *human capacity*. The themes are discussed in the paragraphs that follow. The responses quoted from the participants are indicated in square brackets and refer to the specific focus group, for example, FG2 and the timestamp as recorded in the transcript.

The ASDF: The presentation of the ASDF was well-received and included comments such as [FG2 [00:39:31]] *"... this is really very comprehensive. There's a lot of detail, but the framework is simple enough"* and [FG2 [00:45:18]] *"[the ASDF] is linked to different theoretical frameworks that are already existing on models that support [the ASDF] concepts"* and [FG1 [00:03:58]] *"...timewise in addressing the need for argumentation as this is a general concern, not only for studies but also when one needs to publish"*. Concerns expressed included comments such as *"...the person that will implement it will have to understand the environment"* and *"...buy-in is required as the framework may be difficult to implement"*.

Argumentation Model: As to the theme of the use of an argumentation model that can be used to augment argumentation skills, in this instance Toulmin, the participants in the focus groups agreed that *"Toulmin is an acceptable model"* and [FG 3 [00:48:05]] *"... it empowers them [the students] to make the difference between criticizing an argument and criticizing the person [other students]"* but warned that [FG3 [00:50:39]] *"...having taught Toulmin's to [postgraduate] students at previous university, it's hard. It's a very hard way of reasoning"*.

Although the presentation during the focus groups focused on the lack of argumentation skills and the implementation of the ASDF in a research course, it quickly became apparent from the participants that additional factors should be taken into consideration, such as language skills. As mentioned by the participants [FG 1 [00:04:37]] *"students need this for studies, ..., they are ultimately going*

to publish.... And if you can't argue, you can't publish. So it's a problem ... made me wondered as to how much of the problem for some students is that they are so much battling understanding English and reading in English and writing in English that they're ... never actually even get to the argumentation skills that they don't have the basic language skills." This was confirmed by [FG 7: [00:38:59]] *"...the thing is people are not used to argumentation. I mean, they're not critical even though they went through three years of an undergraduate degree".*

Infrastructural Requirements: From the discussions and the themes that emerged from the thematic analysis, it was clear that the initial presentation of the infrastructural requirements to include the external resources, institutional resources and supervision resources were problematic (see Fig. 1). In the revised version of the ASDF, the supervision resources were removed and grouped with the human capacity element (representing then both the supervisor and the student) This will be discussed in Sect. 4.

Participants further suggested that the students should receive life skills on each of the levels in the scaffolded learning: [FG 5 [00:37:02]] *"... there is also skills and knowledge attached to each one of those steps, which is admin life skills".* This was further emphasised in the comment of [FG 5 [00:45:52]] *"So many of these students don't want to present. Not because they don't think their research is good, they just don't have the skills to present. And if you don't figure that out, they cannot present the research".* Although not many of the participants commented on access to the external and internal resources, there were general comments on the *"extended registration periods [due to the COVID-19 pandemic], students are not on the same space [some students enrolled much earlier than others]".* Suggestions to counteract this included: *"dividing the students into smaller groups as they register to counter the [current] problem".*

Collaboration: As to the theme of collaboration, it was observed that students can be categorised into three distinct groups, namely (1) those that do not want to work in groups, (2) the competitive student that will work in a group to gain information, but not willing to share and (3) the student that uses the group to share and collaborate to grow and contribute. Another participant contributed to the three distinct groups of students and added that students should be trained on how to [FG 4 [00:31:41]] *"peer-review and contribute to the rest of the group"* and *"not enough is done in the development of the problem statement ... specifically when thinking of advancing to a Master's".* Another viewpoint that the participants had in the theme of collaboration was the discussion on sociotechnical perspectives and social and cultural factors that will come into the interactions and influence the behaviour of the students in the group, among each other and with the supervisor. [FG 3 [01:03:38]] *"...it would be interesting to see in the first place, what collaborations are coming, is it only between the peers and the lecturer? Are those the only parties involved? What is the nature of those interactions?".* The researchers took note of this and will explore the factors of social and cultural interactions in future research. Further comments and discussions related to

constructive learning and comments made on *"Will the learning be structured and facilitated? How to keep the students active in the learning process during the year as students are often eager to start but then wander off"* as summarised by one of the participants as [FG 3 [01:03:09]] *"[the researchers should] consider very carefully, the way you craft the interactions [in the collaborative space]"*. As students are from different groups of academic environments, they must be taught how to formulate questions and post questions in such a way that all can understand them. This was confirmed by [FG3 [00:47:23]] *"...in the ODeL environment ... students don't know each other and, it, this focusing on a specific tool helps them to understand that they need to, to engage with a person's argument and then kind of applying that tool to [ask] ... where's your backing?"* As one of the participants had already implemented group work among postgraduate students, the comments on the administration part should be taken note of, specifically in terms of allowing the students to start the group and thus reducing administration on the side of the e-moderator [FG3 [00:58:58]] *"And then we got the students to contribute to it, ... [this] was simply like one big chat, what made it different was it wasn't supervisor initiated the students actually did"*.

Human Capacity- The Supervisor as an E-Moderator and the Student as a Researcher: The human capacity theme includes both the student as a researcher and the supervisor as an e-moderator. This is different from the original presentation in Fig. 1, where the supervisor was part of the infrastructural resources. From the discussions, it was clear that the ASDF does not take into consideration the capacity of the supervisor. Comments included [FG 1 [00:11:45]] "Different supervisors, different staff members have different levels of skills and have different ways of doing things". Furthermore, the varying capacity of the supervisor to act as an e-moderator may mean training is required: [FG 6 [[00:43:10]] *"...there must be training for a module leader or a research person [because] we were never trained in any of this"*. Adding to the human capacity theme, comments relating to the uniqueness of individual students are of importance and more specific training relating to argumentation skills should be given in the learning path. For example, [PG 5 [00:41:00]] *"...but you start with an easier one. Generic. So you give them that and they work through the process ... and then you do it on a different example and they have to do it then you can see if they understand it or not"*. Of concern to one of the participants is the attrition rate of students in ODeL [FG3 [00:52:54]] *"... will [the course] be in some way structured ...[and]... facilitated ... because we started off with the number of them excited, energized, and then by the end of the year, they were very few in the discussion groups that we, that we had with them"*.

General Feedback and Critical Success Factors: The critical success factors that should be taken into consideration in implementing the framework were highlighted by a participant [FG 9 [00:48:42]] *"From a supervisor perspective, but also from a student [side] ...... [there are] ... some critical success factors ... to make this framework work. So I'm wondering if some of these critical success factors for a*

supervisor could be something that the supervisor would need to be trained in this frame-work". The participant also commented on the implementation of the framework in a large group and that critical success factors should include the size of the group and the capacity of the supervisor [PG 9 [00:49:16]] *"Extremely large group of students, will this model still be practical and will the outcome still be successful? … If you have five [students], then it's easy. If you're one supervisor and you have 20 or 30 students, then it might not be as feasible anymore. So … I'm not sure if it's a critical success factor or a dependability. In that view also, … is the supervisor's capacity"*.

Furthermore, after the themes were identified the code of "critical success factors" that emerged are identified as collaboration, human capacity and infrastructural requirements. These critical success factors support the list of five factors of the institutional management factors, learning environment factors, instructional design factors, support factors and course evaluation factors [39]. Though most of the participants indicated that the focus group discussions were well-organised and presented, there were comments relating to the feedback required on the ASDF that are [FG 9 [00:37:34]] *"theoretical" at this stage as the ASDF is not yet implemented and tested"*. The researchers take cognisance of this and the implementation and testing of the ASDF is considered for future research.

6.2   Online Questionnaire Findings

In addition to the discussions in the focus group, the participants were asked to complete an online anonymous questionnaire, which also served as their consent to partake in the study. In the questionnaire, seven characteristics presented in the ASDF relating to simplicity, comprehensiveness, generality, exactness and clarity [37], usefulness [25] and feasibility [38] were used to measure the extent to which the proposed ASDF contributed to the CSCL in providing an environment that will augment the development of argumentation skills in graduate research. The questionnaire consisted of seven questions based on a five-point Likert scale. Following each of the seven questions, a space was provided in which the participants could respond in their own words. A final space was provided where participants could list any additional suggestions. An example of the online questionnaire can be found at https://forms.office.com/r/t5tmRYKWKj.

Of the question relating to *simplicity*, 31.1% of the participants indicated they agreed and 43.8% indicated that they strongly agreed that the quality of the proposed conceptual framework is uncomplicated in form and design and comprehends the essence of the modelled concepts and included comments such as *"It is sufficiently simple enough with 7 stages - with some broken down into sub-tasks. The components and how they lead to other components is intuiti (sic)"* and *"I found it well explained"*. However, there was a comment that indicated that it was *"… not completely clear what the central focus is - should the contents of the conceptual framework itself be evaluated or is it about the act [should be evaluated]"*. The last comment was made by a participant that was unsure whether the ASDF was already implemented or should the ASDF be evaluated from principles. This was addressed in follow-up focus groups, ensuring that the focus should be on the

evaluation of the ASDF as a guideline that can be used in the implementation of a graduate course.

On the question relating to *comprehensiveness*, 31.1% agreed and 62.5% strongly agreed that the proposed ASDF includes and addresses most of the requirements in CSCL that can be used to enhance argumentation skills in graduate research and included comments such as *"...the framework is (very) comprehensive, but it may need to accommodate social and cultural differences and affordances, on the part of both lecturers/supervisors and students"*. Comments on human capacity critical success factors from the supervision point of view included governance from the university on supervisory capacity and different supervisory styles. Comments on group size included *"The smaller the group size the easier the interaction and assessment and feedback is"* and various comments referred to the problem of English first language and other language barriers as it could impact on the successful outcome of argumentation skills. There was also mention to alignment with existing frameworks and guidelines for graduateness.

On the question relating to *generality*, 56.3% strongly agreed and 37.5% agreed that the proposed ASDF could be implemented in similar scenarios in CSCL environments that could augment argumentation skills for graduate students in research. In the comments section, the participants in general commented that it could be implemented in most graduate and postgraduate courses and mentioned that *"... the discussion groups are a great idea. I advocate certain discussions that have minimal facilitator-intervention"*.

Of the question relating to *exactness*, 43.8% strongly agreed and 37.5% agreed that the proposed ASDF is as far as possible accurate and addresses the perceived requirements for a CSCL environment for the augmenting of argumentation skills in graduate research. The accurateness of the framework, in terms of the success rate of the student's final outcomes, falls outside the scope of this study. This is further emphasised in the comment *"The framework does appear to be rigorous in addressing the requirements of CSCL and argumentation at a graduate level. But this will only be clear when it is implemented and evaluated!"*

Although 50% strongly agreed and 37.5% agreed to the question relating to *clarity*, the comments from the participants were more diverse. Comments included that although the flow is evident and correct, it was not clear as to what the purpose of the course represented in the ASDF was, as reflected by one of the participants as *"Thought the subject matter was argumentation; did not gather that it was topic of own choice in which they APPLIED argumentation"*. This comment was addressed in the follow-up focus groups and is discussed in detail in the section on pedagogical approaches for ASD.

Of the question concerning *usefulness*, 68.8% of the participants strongly agreed and 25% agreed that the proposed conceptual framework is applicable in providing an environment that will augment the development of argumentation skills for graduate research.

Of the question about *feasibility*, 62,5% of the participants indicated that they strongly agreed and 18,8% agreed that the proposed conceptual framework is feasible in providing a CSCL environment that will augment the development of argumentation skills for graduate research. The comments included the complexity as *"The model may be too complex to comprehend in one go"* and human capacity critical success factors that may impact the implementation of the ASDF.

In the *additional comments and feedback section*, the participants agreed that the ASDF is well-designed and will be of use and *"…that it will enhance the student argumentation"*. From the comments, it was also noted that the 'measuring' of the efficiency of the framework will be difficult. The participants recommended that the process be recorded *"from beginning to end in an LMS or tool such as WA [sic-WhatsApp] the qualitative data will be automatically recorded and can be used to show how the arguing skills of students improved - whether they are top students or those who struggle. The idea is to improve this skill as I understand it"*. Other feedback included a broader approach to argumentation skills development, to include the hermeneutical circle works and benchmarking the ASDF against the ACM and AIS Computing/IS curricula. Valuable links to academic articles and books were shared.

7 Revised ASDF

From the thematic analysis, the researchers identified that the human capacity code should encompass the student as the researcher, and the lecturer as the e-moderator. Refer to Fig. 4 where the supervision resources as an element is removed from the infrastructural requirements element and presented as a separate node. The human capacity element then consists of the student as researcher and the e-moderator. The key elements of the revised ASDF include then the course requirements that determine the requirements of the human capacity (consisting of both the student and the e-moderator), infrastructural requirements and the pedagogical approaches used in ODeL. The course requirements, pedagogical approaches, human capacity and infrastructural requirements are applied in the ODeL technology infrastructure. Evaluation of the approach is through learning analytics and evaluation. As for the development of argumentation skills, the scaffolded learning approach within the CSCL environment is provided by the LMS. The assessment of the output - in this study, the presentation of a well formulated argument - is conducted through the technology provided by the LMS.
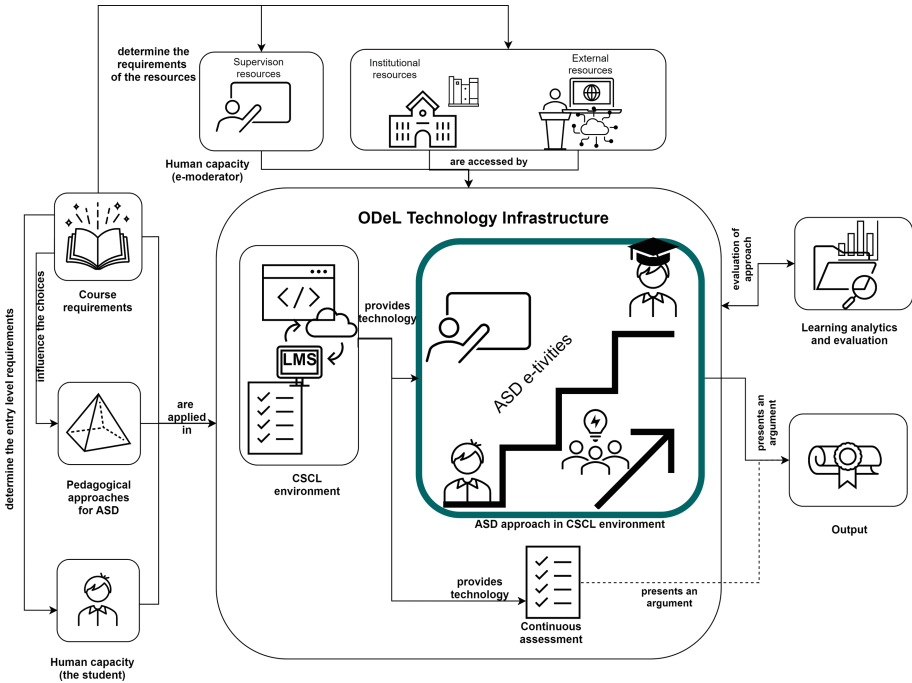
Fig. 4. Revised argumentation skills developments framework (ASDF)

8   Conclusion

The developing and presenting of a well formulated research argument is core in the learning journey of a graduate student. The use of CSCL in ODeL plays an important role in providing a platform for graduate students to engage in academic discourse that will support the development of their argumentation skills. It was highlighted in literature that there is a need for a framework using CSCL that will contribute to the development of argumentation skills in graduate studies.

From the online discussions, it was clear that the ASDF does not sufficiently focus on the human capacity of both the student as a researcher and the e-moderator. In the revised ASDF, (Fig. 4), this was addressed by removing the e-moderator (as supervisor) from the infrastructural requirements to its own space.

The findings are confirming that there is a need for a framework that can be implemented in a graduate course that will augment the development of argumentation skills. Furthermore, collaboration among students is of importance to foster their sense of working together to reach a higher goal, in this instance, the development of a well-formulated argument.

The participants in the focus groups provided valuable insights into the ASDF. Furthermore, the themes that emerged from the discussions suggest that

the key elements are required in a CSCL conceptual framework, and the conceptual framework can be used as a guideline when developing a research course with argumentation skills development embedded. From the feedback relating to the element of the human capacity, with the student as a researcher and the e-moderator, the researchers in this study realised that more research should be done to measure the social, cognitive and teaching presence of the learning experience.

The theme relating to the use of the argumentation model, with specific reference to Toulmin, was widely discussed. Although there were suggestions for other models, the participants all agreed that Toulmin is a good and well-researched model to implement.

As to the theme relating to collaboration, the participants agreed that the scaffolded pathway and collaboration are to the advantage of the students' research development. The mapping of Bloom's taxonomy and the SAQA CCFOs in the learning path was commended, although there were participants that mentioned that some students may have to go back a step or two before advancing to the next level.

The researchers acknowledge that there are some limitations to this study in that the ASDF is developed for incorporation into graduate courses in ODeL. Furthermore, the study included a relatively small number of participants in the various focus groups.

To complete this paper, the researchers identified topics for further research, that include the research into the element of human capacity with specific focus on the critical success factors that may influence the success of the ASDF. Measuring of the educational experience from the students' perspective in terms of social, cognitive and teaching presence has been identified as an area of further studies as well as research into determining whether the arguments presented by the students that were part of this graduate course improved their final project and final results. The learning analytics concerning the experience of the elements of the community of practice, namely practice, domain and community from the student's perspective, falls outside the scope of this study and is considered for future research. Reflecting on the use of MS Teams as a platform for conducting focus group sessions, the researchers propose a need to identify the strengths and weaknesses of using virtual platforms for a comparative research study.

References

1. Rapanta, C., Walton, D.: The use of argument maps as an assessment tool in higher education. Int. J. Educ. Res. **79**, 211–221 (2016). https://doi.org/10.1016/j.ijer.2016.03.002

2. Andrews, R.: Argumentation in Higher Education. Improving Practice Through Theory and Research. Argumentation in Higher Education. 1st edn. Routledge, Milton Park (2009). https://doi.org/10.4324/9780203872710

3. Rapanta, C., Macagno, F.: Evaluation and promotion of argumentative reasoning among university students: the case of academic writing. Revista Lusófona de Educação. **45**, 125–142 (2019). https://doi.org/10.24140/issn.1645-7250.rle45.09

4. Manyike, T.V.: Postgraduate Supervision at an Open Distance e-Learning Institution in South Africa. S. Afr. J. Educ. **37**(2), 1–11 (2017). https://doi.org/10.15700/saje.v37n2a1354

5. Laeeq, K., Memon, Z.A.: Strengthening virtual learning environments by incorporating modern technologies. In: Arai, K., Bhatia, R., Kapoor, S. (eds.) CompCom 2019. AISC, vol. 998, pp. 994–1008. Springer, Cham (2019). https://doi.org/10.1007/978-3-030-22868-2_67

6. Pollard, R., Kumar, S.: Mentoring graduate students online: strategies and challenges. Int. Rev. Res. Open Distance Learn. **22**(2), 267–284 (2021). https://doi.org/10.19173/irrodl.v22i2.5093

7. Vasquez-Colina, M.D., Maslin-Ostrowski, P., Baba, S.: Tapping into graduate students' collaborative technology experience in a research methods class: insights on teaching research methods in a Malaysian and American setting. Int. J. Teach. Learn. High. Educ. **29**(2), 281–292 (2017). https://eric.ed.gov/?id=EJ1146141

8. Fatimah, F., Rajiani, S.I., Abbas, E.W.: Cultural and individual characteristics in adopting computer-supported collaborative learning during Covid-19 outbreak: willingness or obligatory to accept technology? Manage. Sci. Lett. **11**, 373–378 (2021). https://doi.org/10.5267/j.msl.2020.9.032

9. van Biljon, J., Pilkington, C., van der Merwe, R.: Cohort supervision: towards a sustainable model for distance learning. In: Tait, B., Kroeze, J., Gruner, S. (eds.) SACLA 2019. CCIS, vol. 1136, pp. 147–162. Springer, Cham (2020). https://doi.org/10.1007/978-3-030-35629-3_10

10. Letseka, M.: Stimulating ODL research at UNISA: exploring the role and potential impact of the UNESCO chair. Open Learn. **36**(2), 133–148 (2021). https://doi.org/10.1080/02680513.2020.1724780

11. Mochizuki, T., Chinn, C. A., Zimmerman, R.M.: Grasping evidence with EDDiE : a CSCL tool to support collaborative reasoning about disagreements in multiple documents. In: Proceedings of the 14th International Conference on Computer-Supported Collaborative Learning-CSCL 2021, pp. 271–272 (2021). https://repository.isls.org//handle/1/7339

12. Hmelo-Silver, C.E., Jeong, H.: Benefits and challenges of interdisciplinarity in CSCL research: a view from the literature. Front. Psychol. **11**, 1–11 (2021). https://doi.org/10.3389/fpsyg.2020.579986

13. Järvelä, S., Rosé, C.P.: Advocating for group interaction in the age of COVID-19. Int. J. Comput. Support. Collaborative Learn. **15**(2), 143–147 (2020). https://doi.org/10.1007/s11412-020-09324-4

14. Wenger, E.: Communities of Practice: Learning, Meaning, and Identity. In: Brown, J.S., et al. (ed.) Cambridge University Press, Cambridge (1999)

15. Toulmin, S.E.: The Uses of Argument. Cambridge University Press, Cambridge (2003)

16. Tsai, P.S., Tsai, C.C.: College students' skills of online argumentation: the role of scaffolding and their conceptions. Internet High. Educ. **21**, 1–8 (2014). https://doi.org/10.1016/j.iheduc.2013.10.005

17. Wenger-Trayner, E., Wenger-Trayner, B.: Communities of practice: a brief introduction, in STEP Leadership Workshop, University of Oregon, National Science Foundation (US) (2011). http://hdl.handle.net/1794/11736
18. Andrew, M., Arnold, J.: Collaboration, community, identity: engaged e-learning and e-teaching in an online writing course. In: The Australasian Society for Computers in Learning in Tertiary Education, pp. 106–117 (2011)
19. Maor, D., Currie, J.K.: The use of technology in postgraduate supervision pedagogy in two Australian universities. Int. J. Educ. Technol. High. Educ. **14**(1), 1–15 (2017). https://doi.org/10.1186/s41239-017-0046-1
20. Zanjani, N., Edwards, S.L., Nykvist, S., Geva, S.: The important elements of LMS design that affect user engagement with e-learning tools within LMSs in the higher education sector. Australasian J. Educ. Technol. 33(1), 19–31 (2017). https://doi.org/10.14742/ajet.2938
21. Blenker, P., Dreisler, P., Faergemann, H.M., Kjeldsen, J.: A framework for developing entrepreneurship education in a university context. Int. J. Entrepreneurship Educ. Univ. Context **5**(1), 45–63
22. Jeong, H., Hmelo-Silver, C.E.: Seven affordances of computer-supported collaborative learning: how to support collaborative learning? How can technologies help?. Educ. Psychol. **51**(2), 247–265 (2016). https://doi.org/10.1080/00461520.2016.1158654
23. Salmon, G.: E-tivities: The Key to Active Online Learning. On the Horizon, 2nd edn. Kogan, London (2003) https://doi.org/10.4324/9780203074640
24. Salmon, G.: e-Moderating: The Key to Teaching and Learning Online, 3rd edn. Taylor & Francis Group Routledge Falmer, London and New York (2011)
25. Li, K.M.: Learning styles and perceptions of student teachers of computer-supported collaborative learning strategy using Wikis. Australas. J. Educ. Technol. **31**(1), 32–50 (2015). https://doi.org/10.14742/ajet.521
26. Oh, E.G., Kim, H.S.: Understanding cognitive engagement in online discussion: use of a scaffolded, audio-based argumentation activity. Int. Rev. Res. Open Distance Learn. **17**(5), 28–48 (2016). https://doi.org/10.19173/irrodl.v17i5.2456
27. Ali, W.: Online and remote learning in higher education institutes: a necessity in light of COVID-19 pandemic. High. Educ. Stud. **10**(3), 16–25 (2020). https://doi.org/10.5539/hes.v10n3p16
28. Manca, S.: Snapping, pinning, liking or texting: investigating social media in higher education beyond Facebook. Internet High. Educ. **44**, 1–13 (2020). https://doi.org/10.1016/j.iheduc.2019.100707
29. Jung, I., Lee, J.: A cross-cultural approach to the adoption of open educational resources in higher education. Br. J. Educ. Technol. **51**(1), 263–280 (2020). https://doi.org/10.1111/bjet.12820
30. Van der Merwe, R., van Biljon, J.: Trends, drivers and barriers influencing cloud computing services for mobile interactions in teaching and learning. In: Proceedings of 2nd Conference on Information Communications Technology and Society (ICTAS), pp. 57–62 (2018). https://uir.unisa.ac.za/handle/10500/23686
31. Eneje, S.: Real-world applications of mobile learning tools in engineering: prospects, hindrances and accessibility in conjunction with scholastic views. In: 2020 IEEE Canadian Conference on Electrical and Computer Engineering, pp. 1–8 (2020). https://doi.org/10.1109/CCECE47787.2020.9255769
32. Kotze, D.A.: Theoretical framework for open distance learning: a South African case study. Independent J. Teach. Learn. **16**(1), 10–23 (2021)

33. Hirata, H., Okada, S., Nitta, K.: Analysis of argumentation skills for argumentation training support. In: Arai, K., Bhatia, R., Kapoor, S. (eds.) Intelligent Computing. Comp 2019. Advances in Intelligent Systems and Computing, vol. 997 (2019). https://doi.org/10.1007/978-3-030-22871-2_23

34. Lee, C.I., Yang, Y.F., Mai, S.Y.: The impact of a scaffolded assessment intervention on students' academic achievement in web-based peer assessment activities. Int. J. Distance Educ. Technol. **14**(4), 41–54 (2016). https://doi.org/10.4018/IJDET.2016100104

35. Anderson, L.W., Krathwohl, D.R.: A taxonomy for Learning Teaching and Assessing - A Revision of Bloom's Taxonomy of Educational Objectives. Longman, 1st edn. Pearson, Londono (2001)

36. Altebarmakian, M., Alterman, R.: Cohesion in online environments. Int. J. Comput. Support. Collaborative Learn. **14**(4), 443–465 (2019). https://doi.org/10.1007/s11412-019-09309-y

37. Oliver, M.S.: Information Technology Research: A Practical Guide for Computer Science and Informatics, 3rd edn. Van Schaik Publishers, Pretoria, South Africa (2013)

38. Jung, I., Sasaki, T., Latchem, C.: A framework for assessing fitness for purpose in open educational resources. Int. J. Educ. Technol. High. Educ. **13**(1), 1–11 (2016). https://doi.org/10.1186/s41239-016-0002-5

39. Cheawjindakarn, B., Suwannatthachote, P., Theeraroungchaisri, A.: Critical success factors for online distance learning in higher education: a review of the literature. Creative Educ. **03**(08), 61–66 (2012). https://doi.org/10.4236/ce.2012.38b014