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Voces ex machina: a literature review of the key elements necessary for success in online courses.

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Abstract

This paper begins with a description of the architecture of an online teacher education course the evolution of which was informed by this critical review. The course structure is described; links between online learning and teacher education are outlined; key research questions are identified; a synoptic overview of the online course is provided and finally a critically review of key literature is given in relation to the factors affecting success in online platforms. The review itself is contextualised using the three online learning domains identified in the seminal work of Garrison, D.R, and Anderson, T. (2003): Teacher-student interaction (T-S), its reverse, (S-T), and finally, Student-Design interaction (S-D) in which the student interacts with the course design itself. Ultimately, the findings are amplified in the conclusions section and success vectors identified.

Context of the Review

The School of Education of Glasgow University designed and implemented a unique programme of study in Scotland in 2014 through close collaboration with Dumfries and Galloway Council and the University of Paisley through directly funded support from the Scottish Executive. The Council had faced considerable challenges when attempting to recruit appropriately qualified Secondary school teachers, particularly in English and the Sciences. The geographic position of this authority in relation to ITE providers together with its internal scale combined to create significant staffing difficulties. One potential solution was felt to be the provision of Professional Graduate Diploma courses in a range of shortage subjects delivered through the medium of distance learning in conjunction with the University of Paisley. So, Glasgow University agreed to provide the necessary subject-related components for a PGDE (Secondary) in English as part of this synergistic work with Paisley University.

Online Learning and Teacher Education: a Widened Perspective

While the online learning construct just described might appear to be singular and esoteric as a one-of-a-kind distance learning course, online learning as a pedagogic tool or scaffold to support teacher education is a phenomenon in the throes of considerable growth within University Schools of Education in Scotland (and even globally if we examine the geographies of the articles selected for review). In Glasgow, the platform used is Moodle; in Strathclyde, Blackboard, whereas the universities of Stirling and Aberdeen both use WebCT. These developments within Higher Education environments are happening against the wider backdrop of online developments on a national level for schools such as the National Grid for Learning in England, the recent launch of the

schools' intranet GLOW in Scotland and developments in e-assessment by the Scottish Qualifications Authority.
It is arguable, therefore, the development of our knowledge of online environments is significant both intrinsically, for use within our own teacher education courses and extrinsically, for use by our graduates within the Further education, Secondary, and Primary sectors.

Indeed, while Ramsden (2003) argued that, "Higher education has become part of a global shift to a new way of creating and using knowledge," his sentiments could hardly be more apposite to the imaginative crossroads at which we now find ourselves in terms of the opportunities and challenges presented by online learning in the 21st century as, according to Anderson, T (2004) "it [online learning] is still very much in a fluid and changing state," while at the same time curricular change at the level of the school curriculum is seismic.

Key research question: **What are the key elements necessary for success in online learning environments?**

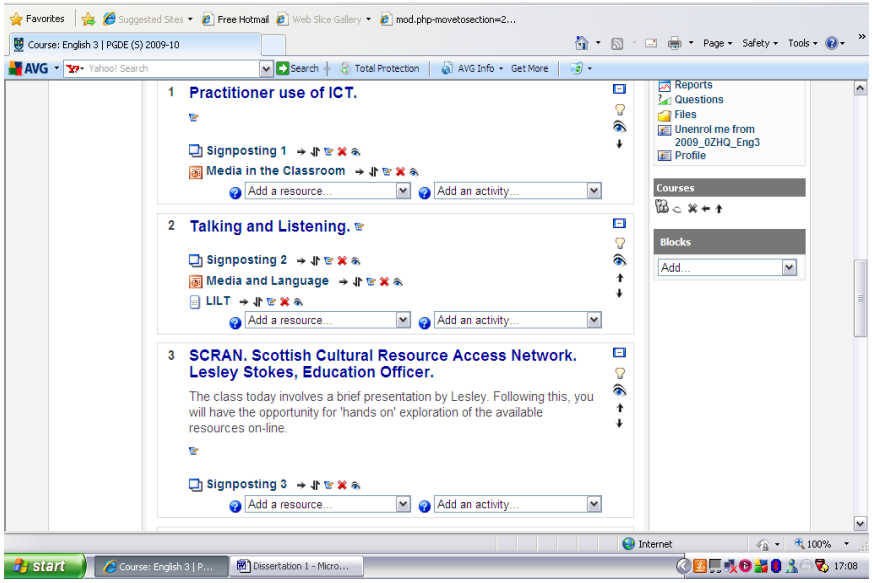
Overview

It may be helpful, at this point, to provide a synoptic overview of the actual course design as a referent for the literature review that follows. Initially conceived of as a course requiring minimal levels of intervention, it was based on an established and successful course (according to both student and external examiner evaluations). It was, therefore, assumed that it should be able to run with minimal tutor input. However, as the course progressed, this minimalist viewpoint changed. It became evident that no matter how well-prepared the instructional design of the course is, there appears to be an imperative towards humanising the machine environment, so that tutors really hear the *voces ex machina* – the voices from the machine. Tutors will attempt this, as will students as is evinced in their meetings in a real café instead of the perfectly functional virtual café provided online. At the heart of online learning there also seems to be the need to interact not only with the medium and the activities (inner or outer) but also with each other and with tutors.

The course was designed to be a mirror image of its faculty-based counterpart to create an authentic learning experience for the participants and to dilute the text-based form of the medium. It began with a f2f meeting during which students were also provided with a training session on the use of the Moodle intranet. The online course is divided into three units of learning which mirror those of the conventional course. Each unit is then sub-divided into learning blocks. These blocks contain links to journal articles, professional literature and also serve as a receptacle for the collaborative work of students. Each block opens with a 'signposting' providing direction for the learner through the activities associated with the block. Skeletally, each block is gelled together by a podcast of the lecture and a copy of the power point used with that lecture together with electronic copies of all resources issued at the lecture. Students are asked to listen to the podcast while tracking through the power point at the same time. Activities are of two kinds:

inner activities, which are asynchronous and outer activities, which are broadly synchronous and require collaboration in the conferencing forum. All activities are designed to be authentic in terms of their direct applicability to the professional skills required while on school placements. A social forum is also provided to enable students to support each other through the course. To enhance the outer activities and to promote greater interaction, a chat room is provided and the opportunity for teacher-student interaction *via* not only the forum but also through direct e-mail and telephone contact. Online journals are also used to create the opportunity for critical reflection while students are on teaching placements. The following review, then, explores what the literature says about the key elements for successful online learning.

A cross – sectional view of the online course



Literature review

This critical review begins with an attempt to frame the course within the parameters defined by Garrison, D.R. & Anderson, T. (2003) and to then weigh these against the other findings in the literature. The comment by Garrison, D.R. & Anderson, T (2003:2) that we are still experiencing e-learning in its embryonic form and that it is currently an "enhancement of current practices" and echoing the sentiments of Marshall McLuhan (1995) that "the content of a new medium is always an older medium," certainly resonates with this university teacher in terms of his own professional development as an online provider. Key management strategies are provided including: the use of a collaborative, constructivist approaches; the need to protect against information overload; managing experiences both individual and collective; creating the opportunities for active learning as well as emphasising the communicative and interactive features of online learning. Citing Bereiter's (1992) idea that "the teaching of high level concepts inevitably involves a considerable amount of discourse" they ask if e-learning can change the "educational transaction" to "fuse individual objective and shared objective worlds"

(2003: 3) to create a blend of individual and collaborative learning experiences. Additionally, the transactional qualities of online learning are emphasised, in order to create an appropriate balance between content and depth of learning and so the following analysis will make use of the categories and focus on the broad interactive strategies of: student-design (S-D), tutor-student (T-S) and student-tutor (T-S) interactions.

Anderson, T. (2004) follows up on this earlier work using the "four lenses of convergence for virtual learning environments" devised by Bransford, Brown and Cocking (1991) cited in Anderson, T. (2004:35). The four key "convergences" are: the learner-centric; knowledge-centric; assessment-centric and the community-centric. Addressing the central problem of learner centredness means the need to know something of student's pre-existing knowledge and while Anderson, T. (2004) recognises that this is a significant problem in online learning, his solution - a kind of middle way – to make time for the student to "express any issues or concerns" possibly through the use of "virtual icebreakers," (2004:36) cannot address the fundamental problem he identifies - whether the student is a match to the course as well as the reverse. Within the boundaries of the knowledge - centred dimension, Anderson, T. (2004) also identifies a number of crucial concepts and, in particular, the idea that the subject itself will have an impact on how it is transmuted into the course in terms of content and so: **"**effective learning is both defined and bounded by the epistemology, language and context of disciplinary thought." (2004:37).

In terms of assessment**,** the importance of formative feedback is stressed as well as student self - evaluation while the final dimension of community - centredness is more problematic in that it is more challenging than we might think to sustain online communities. To reinforce this, Anderson cites an ethnographic study by Hine (2000) in which a lack of "placedness" (2004:40) was found among the students, although ultimately, Anderson re-emphasises the importance of interaction, both expanding and amplifying his earlier work with Garrison, D. R. and Anderson, T. (2003) to broaden the scope of online interaction to: student–student, student-content, tutor-tutor, tutor-content, and content-content.

The earlier work of Britain, S. and Liber, O. (1999:1) is also significant for the later study in that it "focuses on developing a theoretical basis from which to draw pedagogical evaluation criteria." In it, they cite three models of online architecture: the "content and support; the wrap-around model, (where materials are wrapped by activities and discussions); the integrated approach (which is resource-based with dynamic contents and with contributions by tutors)" and although they rightly point out that the focus in much of the literature is, perhaps, misdirected as improving quality "and learning and teaching and reducing administrative burdens will not *per se* improve attainment outcomes." Essentially, their work identifies four criteria drawn from Laurillard's (1993) conversation framework, the key characteristics of which are the: discursive, adaptive, interactive and reflective domains from which they extrapolate four helpful key questions to be asked in the process of evaluating the effectiveness of an online course: How well does it support conversation? **(T-S, S-S)**; How easy is it to adapt activities? **(S-D, T-D)**; Does it allow students to reconstruct the materials presented? **(S-D)**; and are there

opportunities for reflection? **(S-S, S-T, T-S).** Using the emboldened categories devised by Garrison, D. R. and Anderson, T. (2003), it can be seen (via the mapping) that Britain, S. and Liber, O. (1999) are strongly supportive of an interaction-based, constructivist model of online course design.

This constructivist philosophy is also evident in the work of Jennings, D. (2005) who, citing Ramsden, P. (1992) argues that students are "interacting with and transforming received knowledge so as to make it their own and make it personally meaningful." (2005:160). According to Jennings, D. (2005:160) citing Nicol *et al* (2002) students do this by "actively constructing or reconstructing information." Indeed, he takes this idea one step further by positing that one of the potentials for blended learning environments is the possibility that "the academic may…initiate online collaborative projects to stimulate and develop ideas and theories beyond their face-to-face meetings." (2005:Introduction). In other words, the potentialities for the mutual support of both the online and the f2f elements of the course are observed. Jennings goes on to construct a "set of guiding principles" (2005:160) to determine, "the measure of a learning environment" (2005:160) and argues that it should provide: clear learning objectives and learning outcomes; learning grounded in effective, i.e. contextual, authentic, case-based examples; a manageable workload; an emphasis on time to be spent on task; encouragement for contact between students and faculty; an environment where reciprocity and co-operation are fostered among students; opportunities for active learning; deep learning; relevant assessment; rewards for critical thinking; prompt feedback that is commensurate with performance; high expectations; and respect and the accommodation of diverse ways of learning. The flaw in the paper is that is does not delineate how these, entirely laudable, goals are to be achieved and at what cost.

The case study by Kim, H. and Hannafin, M. J. (2007) using case-based reasoning in the training of teachers narrows the (perhaps dilated) evaluative lens of Jennings, D. (2005) somewhat to emphasise the importance of four key issues: situated learning, the use of expert cases, authentic tasks, and activities for novice learners in online courses. Citing Brown *et al* (1989) and Lave and Wenger (1991) the ideas of both cognitive apprenticeship and legitimate peripheral participation clearly underpin this paper. Indeed, the authors believe that students "apprentice in the experts' practices" (2007:151) while developing the understanding, knowledge and skill of a given community and prospective teachers seek to develop the knowledge and skill of expert teachers as well as to transition to the teaching community of practice.

The key problem rightly identified by Putnam and Borko (2000) as well as Sykes and Bird (1992) cited by Kim, H. and Hannafin, M.J. (2007) is the lack of routine access to experienced teachers and everyday classroom dilemmas, although what is omitted is the fact that while access during periods in faculty might not be routine, school placements are a reality in which student teachers would have "routine" access to expert professionals. Another key issue omitted from this paper would appear to be the idea of bridging the digital divide between the online course and the vocational landscape, although the study concludes that prospective teachers "self-reference, analyse, articulate,

and interweave their understanding with experts' knowledge and skill as they initiate their transition and accumulation to the practising teaching community." (2007:166).

In contrast to the former case study, Zhang, D., Zhao, J. L., Zhou, L., and Nunamaker, J. F. (2004) use experimental data to compare the effectiveness of e-learning and conventional classroom learning. They (perhaps unintentionally) circumnavigate the problem of the availability of expert staff by proposing the concept of the virtual mentor and in doing so generate an even greater potential difficulty-its applicability. In most scenarios, this would mean a first principles reconstruction of existing courses and their underlying structures in order to embed the design features of their proposed, prototypical VM called LBA (Learn by Asking) which uses interactive multimedia (including video compressed and stored on a video streaming server) to "present synchronised multimedia materials in an interactive and cohesive manner." (2004:77). Essentially, while this solves one of the great problems of the Moodle platform-the lack of a subject-specific search engine-it possibly generates more problems than it would solve in terms of its applicability, despite claims that it provides "a real alternative to the traditional classroom." (2004: 76)

The Turkish study by Akkoyunlu, B. and Soylu, M. Y. (2008) probes another key dimension of success by investigating learning styles and student views of blended learning. Using a questionnaire and Kolb's Learning style Inventory (LSI) they found that two of the four styles-assmilators and divergers did not have their achievement affected as, "assimilator and diverger learning styles are both equally successful in the online environment." (2008:188). The key weakness of this study, however, is that it did not track the other two learning styles referred to in Kolb's inventory, those of: convergers and accommodators, thus, perhaps overshadowing what otherwise have been certainly fascinating and possibly significant findings. However, three key implications emerge for online teachers: the proportions of the blend between f2f and online learning and so: "it is important to construct equilibrium between e-learning and f2f environments in view of the advantages of both methods during the process of designing a blended learning environment." (2008: 184). The second significant finding reinforces the significance of learning styles and, in terms of online architecture, highlights some salient issues. The researchers reinforce this through reference to Osguthorpe and Graham's (2003) idea that: "instructional objectives; many different personal learning styles and learning experiences; the condition of online resources and the experience of trainers plays an important role designing an effective blended learning environment." (2008: 184). The final and perhaps most important finding is the value placed on the f2f element by students and so the "results of the findings show that f2f interaction is a must for students." (2008:188).

A second Turkish study by Delialioglu, O. & Yildirim, Z. (2007) also examines the effective characteristics of online learning environments by using in-depth interviews and a log system that kept records of web component usage. This was, essentially, a mixed methods approach using a combination of quantitative data such as frequency count and activity durations as well as the rich qualitative data from interviews in order to compare traditional and f2f learning. The findings of the study, as acknowledged by the

researchers themselves, support the, "no significant difference phenomenon." (2007:133). However, they acknowledge that "learning should be at the centre of interest," (2007:133) as opposed to the exploitation of the potentialities of the web as an end in itself-which is significant. One of their key suggestions is that, "the idea behind both (hybrid and blended systems) is to redesign the instruction to maximise the advantages of both face to face and online modes of instruction." (2007:133). Citing Reeves (2002), they delineate the most effective dimensions of interactive web-based learning by expanding on the existing frameworks to encompass on a 10 point continuum: pedagogical philosophy (from instructivism to constructivism); learning theory (from behavioural to cognitive); goal orientation (from sharply focused to general); task orientation (from academic to authentic); source of motivation (from extrinsic to intrinsic); teacher role (from didactic to facilitative); metacognitive support (from unsupported to integrated); collaborative strategies (again from unsupported to integral); cultural sensitivity (from insensitive to respectful); and finally structural flexibility (from fixed to open). These are then applied to the pragmatic elements of online learning using Caladine's (1999) MOLTA model (Model for learning and teaching activities) which compares the differences between blended and traditional courses. See below:

Traditional Elements	**Hybrid Course**
Delivery of Material	Website, online materials
Interaction with materials	Multimedia, web browsing, cognitive tools, homework, quizzes, classroom activities
Interaction with the teacher	Web announcements, forum, phone, face-to-face, interaction, consultation
Interaction between students	Web forum, e-mail, group work, class discussions, projects
Intra-action	Class discussions, group work, web forum

The central finding is that the design, development, and implementation processes for a blended learning environment are different from those in a purely traditional, face-to-face lecturing course or a purely web-based course and so from the "results of this study, the following suggestions are made for the development and implementation of hybrid instruction: don't hybridise only the technologies; hybridise the pedagogical philosophies, theories, and instructional design methodologies; give special attention to student motivation in hybrid courses; provide tools for metacognitive support; use multimedia in the web component to enhance learning; encourage and provide facilities for student-student and student-instructor communication; provide students with online self-assessment tools"; and most interestingly "provide print materials." (2007:144).

Another comparative study by Johnson, S. D., Aragon, S.R., Shaik, N., and Palma-Rivas, N. (2000:30) seeks to, "accurately determine the benefits and pitfalls of online instruction, particularly when compared to the more traditional face-to-face learning

environment." (2000:30). The points of comparison, "included student ratings of instructor and course quality; assessment of course interaction, structure, and support; and learning outcomes such as course projects, grades, and student self-assessment of their ability to perform various ISD tasks." (2000:30). Their study "is an attempt to determine if properly designed environments that differ on many characteristics, can be equivalent in terms learning and satisfaction," (2000:30) and therein lies its principal flaw in that two essentially different things are being compared. However, many of their findings both reinforce other findings in the literature and contribute to it. They recognise, for example, that although student perceptions are important, the ultimate indicator of course effectiveness "is the degree to which students reach the learning objectives." (2000:41). This is also reflected in the work of McGuire, W. (2009) where it is argued that much of the literature tends to focus on levels of student satisfaction divorced from learning outcomes when determining the effectiveness of courses. Equally, "student satisfaction with their learning experience tends to be slightly more positive for students in a traditional course format although there is no difference in the quality of the learning that takes place." (2000:44). It is possible that "even though the amount of interaction may have been adequate to support their learning, it may not have been equal to what was expected." (2000:45).

One of the key the findings in this study suggests that "online instruction may not be suitable for courses that require high degrees of student-instructor interaction and feedback, such as performance-based training methods… courses that rely on considerable mentoring and coaching until the technologies for online instruction better simulate real time interaction." (2000:47).

Shifting focus from comparative studies, the personal reflection based on ten years experience of online teaching by Lieblein, E. (2000) examines the critical factors for successful online delivery and it, essentially, adds the following key ingredients: on-campus visits or an adequate substitute (notably recognising that online courses must be maintained); creating a sense of class, school and university (or group identity); maintaining a teacher-present environment; providing timely responses; and providing a clear description of the approach to pedagogy to be undertaken by the tutor.

While personal reflections can (and should) contribute to the literature, one of the core omissions in the field is recognized by Sitter, V., Carter, C., Mahan, R., Massello, C., and Carter, T. (2009) citing Reasons *et al* who note that, "there is a lack of definitive longitudinal research supporting hybrid course designs." (2009:41). As is the case with Garrison, D. R. & Anderson, T. (2003) and Anderson, T. (2004) their central concern in exploring the views of both faculty and students of an MBA programme is with the concept of interaction. They believe that pure online courses cannot provide the quality of interaction necessary for effective learning. Citing Hensley (2005) who "found that something was missing," (2009:40) and Shachar & Neumann (2003) who found that "wholly online courses did not provide the critical interaction between professor and student that has been deemed as essential for effective learning." (2009:40). In contrast, they cite Rovai and Jordan's (2004) findings that "the concern regarding student and faculty presence (i.e., interaction) was lessened in hybrid or blended courses," (2009:43)

although challenges still persist. For example, they cite Lynch and Dembo (2004) who found "that assessing learning outcomes in a hybrid course design requires an integrative and collaborative interaction between the student and the instructor," (2009:43) while the work of Stodel, Thompson, and MacDonald, (2006) is cited to demonstrate that "although many online, interactive learning events such as online discussion and collaborative projects do promote interaction, it is important that faculty continually reinforce, challenge and provoke learners to critically reflect on course concepts and construct new bases of knowledge as they interact in these events." (2009:42). This view is also shared by Garrison, Anderson, & Archer, (2001) whom they also cite to reinforce that "to achieve high levels of interaction and collaboration, faculty must guide, support, and nurture a learning environment." (2009:42). At the same time, though, they recognise that learners must be "challenged to take responsibility for their own learning," (2009:42) citing Bonk, Kyong-Jee, & Zeng, (2004).

The study of student characteristics for online learning success by Kerr, M.S, Rynearson, K., and Kerr, M.C. (2006) looks at the whole issue of blended learning from the other side of the looking glass. Instead of considering what can be done to make the learning environment itself more conducive to success, they ask the question: what student characteristics are required for success? They note that, "many have documented the need for sound research on online learning and student characteristics," (2006:92) citing (Bocchi, Eastman, & Swift, 2004; Moore, 2004; Watkins & Schlosser, 2003).

Across the three studies, four perhaps unexpected characteristics emerged as most important for understanding and predicting online student success including: reading and writing skills, independent learning, motivation, and computer literacy, although during the study the search for successful characteristics online becomes secondary, perhaps, to validating the TOOLS construct. Nonetheless, this perspective is akin to the learning styles or preferences issue identified by Akkoyunlu, B. and Soylu, M.Y. (2008) and Osguthorpe and Garnham (2003) and deserves further investigation.

Again, while helpful, the latter study, does not focus on the specificity of issues surrounding blended learning in Initial Teacher Education programmes. King, K. P.'s (2002) study, however, does. The focus of this penultimate study, like the final one, is clearly situated in teacher education. The study by King, K. P. (2002) seeks not only to identify the, "purpose, potential and place of online learning in teacher education," (2002:232) but also moves the quantification of success, "beyond test scores and achievement, and instead reaches toward personal and professional perspectives, learning communities, communities of practice, and lifelong learning," (2002:234) and in doing so highlights six essential elements for the success of online learning: "the presentation of accurate, current, and substantial content; in-depth dialogue among course participants about the content meaning, application, and implication; the ability for learners to be able to ask questions and share responses in an environment that can be personalised to support responsiveness, trust, and insight; the ability of the technology to work smoothly enough to not detract from learning ;the capability to facilitate collaborative work among learners easily; the development of assignments that can both apply to the classroom and to academic research." (2002:235). While these are laudable aims, it would appear that

the definition adopted of "quality courses" is not indexed against learning outcomes but to the construction of a course along constructivist or transformative lines.

In the final paper for this review, the focus remains on teacher education. The USA study by Schrum, L. Burbank, M. D. and Capps, R. (2007) considers how best to prepare future teachers online by focusing on student perspectives as, citing Scrum (2002), they recognise that, "most of the literature has focused on programmatic, technological, and implementation issues, rather than on student-centered perspectives." (2007:205). Using a four way data set comprising of: a survey, two open ended questions posted each month, and a post-survey their approach combines both quantitative analysis and narrative data while the framing of the study "includes three elements: the domain of knowledge; the community of people; and shared practice." (2007:206). Interestingly, they found the most successful aspects to be: flexibility of timing; e-mail interactions; interactions through postings; and tutor involvement while one of the least successful aspects was engagement in group assignments.

Conclusions

The literature supports the following findings and identifies key success vectors: that hybrid/blended courses are perhaps more successful than purely online courses in terms of levels of student satisfaction, although the, "no significant difference" response highlighted by Delialioglu, O., and Yildirim, Z. (2007:133) is very common in terms of the attainment of learning outcomes. Equally significant is that the concept of interaction is also highlighted as a key feature of successful online learning whether this is within the three point model of Garrison, S. D. and Anderson, T. (2003): T-S, S-T, S-D, or the amplified design by Anderson, T. (2004) which recognises: S-S, S-C, T-T, T-C, and even C-C interactions. These interactions, however, need to be managed, for example, in the balance across individual and group activities and in the broader mix between f2f and online activities as well as in the attempt to seek an equilibrium in these acceptable to all students. Indeed, the latter idea also seems to resonate positively with the notion of digital interconnectivity where we attempt to bridge the gap between theory and practice. There would also appear to be a consensus in the literature that an adherence to constructivist principles will improve the success of online learning environments and so: collaborative work; opportunities for deep learning; self assessment; and active learning are all advocated as significant success determiners. The research methods deployed in the field, too, while varied, show definite signs of the deployment of mixed methods to include both quantitative and qualitative strains and there would appear to be a strong emphasis on student perceptions of success in online courses. Finally, there is also evidence of the issue of success in online learning being examined from the other side of the looking glass, for example in the research examining the student characteristics necessary for successful online learning.

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