

Constructing departmental culture to support student development: evidence from a case study in Rwanda

Rebecca Schendel¹

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Abstract In recent years, there have been numerous attempts to improve the quality of higher education in Africa, but there is limited knowledge about the impact of these initiatives on student learning. The results of a study published in 2015 offered some initial data in this regard by identifying a lack of improvement in the critical thinking ability of students enrolled at three of Rwanda's public universities, despite extensive pedagogical reforms across the sector. However, subsequent analysis of the study data suggests that this lack of improvement is not a general phenomenon, as students graduating from the KIST Faculty of Architecture and Environmental Design appear to exhibit deeper approaches to learning and stronger critical thinking skills than graduates with similar backgrounds from other Faculties involved in the study. This paper examines the factors that appear to have contributed to this outlying Faculty's success and argues that departmental culture has played a crucial role, by fostering the conditions necessary for pedagogical innovation.

Keywords Critical thinking · Pedagogy · Higher education reform · Higher education policy · Architecture · Rwanda

In much of the literature on higher education in sub-Saharan Africa, there is an understandable preoccupation with low rates of enrollment, given that the most recent global statistics estimate a gross enrollment rate of 8.6 % for the region, in contrast to figures between 20 and 50 % for other regions in the Global South (UNESCO Institute for Statistics 2016). Although this focus on the challenge of access is a question of crucial concern, equally pressing is the issue of quality, as decades of limited funding for higher education from both international and domestic sources, combined with rapidly increasing

✉ Rebecca Schendel
r.schendel@ucl.ac.uk

¹ Department of Education, Practice and Society, UCL Institute of Education, University College London, 20 Bedford Way, London WC1H 0AL, UK

student enrollments and a significant ‘brain drain’ of academics, is widely acknowledged to have created a ‘crisis of quality’ across the sector (Salmi et al. 1994). In recent years, as higher education has re-emerged as a key development priority in the context of the global ‘knowledge economy’ (Oketch et al. 2014), the implications of this ‘crisis’ have been much discussed, and substantial system-level and institutional-level reforms have been implemented, in an attempt to improve the academic quality of universities across the continent (Brewis and McCowan 2016; Schendel and McCowan 2015).

Rwanda can be considered a crucial case in this regard, having experienced a number of substantial higher education reforms over the past 20 years. As a result of its urgent need for reconstruction following the 1994 genocide and its emphasis on ‘high skills’ industries (Brown et al. 2001) in its national development strategy, since the late 1990s, the Rwandan government has spent a higher proportion of its education budget on higher education than almost any other country in the region (World Bank 2004). It has also overseen a number of sector-wide reform policies, including the creation of a national student bursary program (World Bank 2009) and the adoption of a modular system of instruction (Gahutu 2010). The public universities have also implemented new teaching, learning and assessment policies, intended to improve learning outcomes across the sector.

Although many of the recent reforms implemented across the region have improved the administration and infrastructure of universities (Lindow 2011), it is as yet unclear if these efforts have also had a positive impact on student learning, as there has been a paucity of studies investigating any academic outcomes. However, a recent study in Rwanda provides some evidence of cause for concern. The study, conducted within three of Rwanda’s public universities, investigated the impact of the new teaching and learning policies on student critical thinking ability and found that, despite emphasizing the kinds of pedagogical approaches found to improve critical thinking in other contexts, the reforms did not lead to an improvement in student critical thinking ability within the participating institutions (Schendel 2015). Subsequent case study analysis within five of the participating faculties attributed the limited impact of the reforms to a misalignment between the intentions of the reforms and the behavior of faculty members during implementation (Schendel 2016).

However, the results of the study were not entirely discouraging, as the evidence from the one outlying faculty in the sample—the Faculty of Architecture and Environmental Design (FAED) at the Kigali Institute of Science and Technology—indicates that recent pedagogical innovations within that faculty have had a positive impact on student learning outcomes. The results from FAED suggest that departmental culture plays a crucial mediating role in the implementation of pedagogical reforms, as the teaching culture within FAED appears to have mitigated many of the barriers identified in the other participating faculties.

This paper presents the findings relating to this outlying case. It begins with discussion of the theoretical background and methodology employed in the study before presenting the key results. It then proceeds with a discussion of the factors that appear to have contributed to the faculty’s success and concludes with an examination of the implications for other institutions engaged in processes of pedagogical change.

Theoretical background

Critical thinking is viewed around the world as a crucially important outcome of a university education (Davies and Barnett 2015). However, despite its widespread acceptance, the construct is poorly defined, with theorists disagreeing about what it comprises and how

it can be developed and assessed. Some perceive critical thinking as a set of clearly defined skills (Bell 2005; Ennis 2009; Halpern 1996); others maintain that it is a disposition or way of acting in the world (Barnett and SRHE 1997; Brown 1998). There are also important debates around whether critical thinking is a general or a domain-specific phenomenon (see arguments put forward by McPeck 1981; Moore 2011; Norris 1992; Scriven 2009). As this study looked specifically at critical thinking within the Rwandan university context, a conceptualization of critical thinking was chosen that resonates with discussions of critical thinking in the Rwandan policy literature. Kuhn's theory of critical thinking development suggests that critical thinking comprises three 'meta-knowing competences': cognitive strategies, such as abstraction; metacognitive strategies that allow for control over the thinking process; and an epistemological orientation that recognizes the uncertainty of knowledge (1999, p. 23). Evidence from her empirical research suggests that these competences can be applied to 'ill-structured problems' across domains, provided they are sufficiently developed through practice in individual content areas (Kuhn 2005).¹ Discussions of critical thinking within university policy documentation in Rwanda reflect a similar understanding of critical thinking, as the expectation is that critical thinking can be developed within one academic discipline and then applied to a range of ill-structured problems after graduation.

Kuhn's empirical research suggests that meta-knowing competences can be developed through educational experiences that encourage high levels of student engagement, while also providing a sufficient level of both challenge and support (Kuhn 2005). These dimensions have also been highlighted as crucial factors in the development of student critical thinking skills in a number of other studies of university education (Blair and Wise 2010; Moon 2008; Pascarella et al. 2010). The literature on cognitive development provides a clear justification for why such approaches are likely to influence student critical thinking skills. Piaget's seminal work on intellectual development (1975) suggests that cognition develops through a process of 'equilibration,' in which individuals actively seek to balance their pre-existing knowledge with any new information that contradicts it. In response to such 'conflicts' with new external stimuli, individuals must construct their own understanding of how the new information can be synchronized with their pre-existing cognitive schema (ibid.). In order to stimulate such conflicts, students must be exposed to new ideas and new situations (King and Kitchener 1994). However, it cannot always be assumed that simple exposure to new ideas will stimulate learning. If students are not given support to help with the construction of new understanding when confronted with cognitive challenges, they can retreat from internal conflict by adapting new information to fit their existing cognitive schema (Piaget 1975). Instructors must therefore 'scaffold' the learning experience by building on students' prior learning and presenting new ideas in such a way as to allow for connections to be made between new content and pre-existing understanding (Bransford et al. 1999; Rosenshine and Meister 1992). Maintaining a high level of engagement is also crucial, as the process of engaging with cognitive conflicts can be challenging. If students find difficult coursework to be irrelevant to their lives and futures, they are less likely to invest the energy necessary to construct new understanding (Kuhn 2005).

These conditions for learning can be fostered through a number of specific pedagogical approaches. In particular, the use of 'active' and collaborative methods can have a

¹ 'Ill-structured problems' are defined as problems with no 'correct solution' and 'no way to prove definitively that a proposed solution is correct' (King and Kitchener 1994, p. 6). Such problems must be evaluated in 'light of existing information...that may be incomplete or unverifiable' (ibid.) and, as such, require an epistemological understanding of the unverifiable nature of knowledge.

significant impact (Tsui 2002). Requiring students to grapple with ill-structured problems in class helps to develop epistemological understanding and hone metacognitive skills (Kitchener and Fischer 1990), while exposing them to a range of different perspectives (through collaborative activities, such as group projects and class discussions) pushes them to balance contrasting viewpoints and develop their own arguments. Interactive methods also provide an opportunity for instructors to model the standards or criteria used within a particular discipline when assessing claims or evaluating evidence (Baxter Magolda 1999). Studies have also demonstrated strong links between assessment practices and critical thinking. In particular, open-ended assessments which ask students to demonstrate their own understanding of course content by applying their knowledge to new situations can help to encourage the use of critical thinking skills, provided students have ample opportunity to practice similar activity in low-stakes circumstances and are given sufficient feedback to help them understand their current level of ability in relation to the outcomes they are striving to reach (Entwistle and Entwistle 1997; Tsui 2002).

Although such educational experiences can be introduced within individual modules, the evidence suggests that it is more likely that critical thinking will be encouraged when they are infused throughout the curriculum. Modules relying on constructivist pedagogy can generate resentment among students, as they demand significantly higher levels of cognitive engagement than those not requiring the active construction of new understanding (Entwistle and Peterson 2004). As a result, stand-alone modules using such methods rarely have a positive effect, as they can frustrate, rather than encourage, students. However, incorporating similar methods across the curriculum can help to normalize the approach, thereby reducing student resistance. Furthermore, students are more likely to ‘transfer’ their learning to situations outside the classroom if they have adequate opportunity to apply critical thinking to a range of problems across disciplines (Davies 2006). Studies have also demonstrated that the cultivation of clear connections between individual modules can have a significant impact (e.g., Kember and Leung 2005; Terenzini et al. 1995). The *sequence* of courses within a curriculum also appears to be important (Terenzini et al. 1995). Progressive curricula that gradually expose students to the use of critical thinking in different circumstances and progressively expect a more advanced demonstration of such skills can act to ‘scaffold’ the student learning experience over time.

In addition to directly supporting the development of critical thinking skills, the same pedagogical approaches can also have an indirect effect by encouraging deeper approaches to learning. Marton and Saljo’s (1976) seminal study introduced the notion that there are two primary approaches to learning: a ‘surface’ approach, in which the main motivation is progressing to the next task or level, and a ‘deep’ approach, in which motivation comes from an intrinsic desire to learn and understand. As ‘deep’ learners are more likely to engage in the construction of new understanding than ‘surface’ learners, approaches to learning play a key role in cognitive development. Students enter university with pre-existing attitudes and motivations, but pedagogy is also important in this regard, as student attitudes can change—both positively and negatively—as a result of exposure to different approaches (Biggs 2001; Entwistle 1997).

Although there is a substantial body of literature relating to the success of these pedagogical approaches in a range of university contexts, there is limited evidence from sub-Saharan Africa. In fact, the majority of studies of teaching and learning at the university level have been conducted in high-income, largely Western, contexts. Despite this lack of culturally specific evidence, a number of reforms have been implemented in recent years, which attempt to improve the quality of teaching and learning within African higher education institutions. Most follow the broad principles outlined in this section, as they

promote more active and collaborative learning and a shift toward open-ended, more varied forms of assessment. However, to date, little is known about the impact of such reforms on student learning outcomes.

Research design and preliminary results

The larger study within which this paper sits aimed to contribute to this gap in the literature by investigating the impact of recent reforms on the development of critical thinking skills within Rwanda's public university sector. The study had two primary objectives: (1) to investigate whether or not students at the public universities in Rwanda are improving in their critical thinking ability during university and (2) to identify the institutional factors that seem to help or hinder the acquisition of such skills in the Rwandan university context. These objectives were approached through a mixed-method sequential study.

In the first phase of the study, completed in February 2012, an adapted version of the Collegiate Learning Assessment (CLA), a performance-task-based assessment of critical thinking, was administered to a random sample of 220 first- and fourth-year students attending three of the public universities in Rwanda.² The CLA was chosen as an appropriate assessment for the study, as it asks respondents to use evidence from a series of documents in order to make a decision about an ill-structured problem in a 'real-world' scenario, thereby replicating the application of critical thinking skills assumed within the Rwandan policy literature. Participants were assessed in terms of their ability to evaluate the presented information, evaluate the validity of a presented argument, and use evidence appropriately when making a decision.³ In the aggregate, the assessment results were discouraging, as cross-sectional analysis of student scores indicated no statistically significant difference between the demonstrated critical thinking ability of the first- and fourth-year populations in the study (Schendel 2015).

The second phase, conducted between September and December 2012, aimed to contextualize and expand upon the assessment results by qualitatively investigating the institutional environment within two of the participating universities: the National University of Rwanda (NUR) and the Kigali Institute of Technology (KIST).⁴ This was achieved through the completion of six faculty-level case studies (three from each institution).⁵ Within each faculty, individual and group interviews were conducted with students, faculty members and senior administrators, and relevant institutional policies were examined. In total, five individual student interviews, three student focus groups, nine

² In 2013, Rwanda's public universities were re-designated as constituent colleges of the consolidated University of Rwanda. The individual institutions outlined in this paper are therefore no longer independent entities. However, the names and descriptions of the former institutions have been retained throughout the paper to reflect circumstances at the time of data collection.

³ Further details about the assessment—and the process used to adapt the content for use in Rwanda—cannot be included here due to space constraints but can be found in Schendel and Tolmie (2016).

⁴ As only 35 students from the third institution participated in the assessment phase of the study, it was not possible to draw any firm conclusions based on the cross-sectional analysis, so this institution was not included in the case study phase.

⁵ All three of the faculties at KIST were included in the sample (i.e., the Faculties of Engineering, Applied Sciences, and Architecture and Environmental Design). As it was not feasible to include all of the faculties of NUR in the study, three NUR faculties were purposively selected for inclusion. Two (the Faculties of Science and Applied Sciences) were chosen because of their comparability to similar faculties at KIST; the third (the Faculty of Economics and Management) was included because it is the largest faculty at NUR and also provided the perspective of a social science discipline.

faculty interviews and one interview with a senior administrator were conducted at each of the participating universities. Given the importance of pedagogy in the development of critical thinking skills, the interviews focused primarily on the academic experiences provided to students enrolled in the participating faculties. Student motivations, attitudes and approaches to learning were also explored.

As discussed in the introduction, analysis of the case study data from five of the six participating faculties suggested that the lack of improvement identified in the first phase of the study was likely to be the result of a misalignment between the objectives of the recent reforms and the manner in which the reforms are being implemented within university classrooms. Although the teaching and learning policies at both of the participating institutions require faculty members to implement the kinds of teaching activities found to encourage critical thinking in other university contexts, the evidence suggests that these activities are not being implemented as advocated by the literature in most of the participating faculties. Instead, these practices are being fundamentally altered during implementation, due to limited understanding of the rationale behind the reforms and, in some cases, limited faculty motivation [as discussed in Schendel (2016)].

One possible interpretation of these results is that the pedagogical approaches advanced by the recent policies may not be appropriate for Rwanda. However, the data collected within the sixth participating faculty (FAED) support an alternative interpretation—that more constructivist approaches *can* have a positive impact on student learning outcomes in Rwanda but that such approaches require a supportive departmental culture in order to be implemented successfully.

The context: academic experiences within FAED

A simple descriptive comparison of the academic environment within the six participating faculties highlights the marked difference in academic experiences between FAED and the rest of the faculties in the sample.

First, the curriculum performs a fundamental pedagogical function within FAED. Although the curricula of other academic programs at KIST are cohesive in their content, there is little explicit interaction between modules or intentional structuring of course sequences in any of the other participating faculties. In contrast, interviews with FAED staff indicated that the curriculum was explicitly designed to foster incremental improvement in a number of overarching learning objectives, including critical thinking. In one FAED department (Architecture), for example, participants noted that the program curriculum was developed with an eye to incoming student ability. Rather than assuming that students should already have the skills and confidence to read and write effectively by the time they enter university (an attitude expressed by lecturers in other faculties), faculty participants from Architecture acknowledged the generally low levels of academic preparation of many entering students and explained how they use the program curriculum to support the development of such key academic competencies. Writing skills, for example, are gradually developed by requiring short writing assignments of only a paragraph or two in the first few years and then increasing the length of writing assignments over time. Modules also require more in-class participation as students progress through the program. One core element of the academic experience in all departments of FAED is the weekly oral critique, in which students must explain and defend their design work to their peers and instructors. These increase in length and difficulty with each year of the

program. Crucially, critical thinking is one of the central learning objectives running through the curricular structure. As a result, nearly every module in the curriculum is designed to encourage the development of critical thinking skills through assignments and/or classroom practices.

Participants also described the use of pedagogical practices that combine high levels of challenge with sufficient academic support. Interviews with academic staff in other faculties indicated that most lecturers refrain from assigning lengthy writing assignments. In contrast, students in FAED are frequently required to complete independent writing assignments and design projects. While holding their students to high expectations, the faculty members within FAED also provide a significant amount of support and guidance to help them succeed, by giving frequent and detailed feedback to students on their designs and written work.

Individual modules within FAED also rely heavily on active and collaborative learning techniques. As collaborative learning is now a requirement of all modules at both universities, lecturers in all six faculties confirmed that they frequently assign group projects and incorporate class discussions. However, in the other five participating faculties, student and faculty participants noted that group projects are often limited in scope and that group members are not required to prove any contribution to the final effort. As a result, projects are often completed by one student, with other group members only contributing in minor ways, such as helping to defray the cost of photocopying. In contrast, FAED participants described strict parameters relating to group work that ensure participation by all students. Group assignments are typically too extensive for one student to complete on their own. Furthermore, individual students are often assigned specific tasks within group projects, so that everybody in the group has a particular function to perform. Participants also stressed that all group members are involved in presenting and defending group work, so there is distributed responsibility and incentive for everybody to participate actively throughout the project. In some modules, group assignments lead directly into individual assignments, which means that students can only succeed individually if they have been engaged throughout the group component.

In addition to explicitly collaborative assignments, the model of teaching within FAED is itself essentially collaborative. Studio courses form the core of the FAED curriculum, providing students with substantial opportunities to practice their craft. During the weekly oral critiques, peers are encouraged to critique one another's work, a practice that is likely to help students form their own opinions about design while also learning to listen to—and incorporate—differing perspectives. An explicit emphasis on diverse perspectives also appears to guide the implementation of class discussions within the faculty. Participants indicated that discussions are used to generate debate about controversial topics in architecture and design, rather than to clarify lecture content. In contrast to other faculties in the sample, in which class discussions appear to be largely used as a method for clarifying the 'correct answer,' FAED student participants described class discussions as opportunities for forming opinions about significant issues:

Everybody has time to raise up his ideas and views, and then afterward, whether a student or an instructor ... come up with the conclusion and you can agree or disagree about ... the conclusions.... There isn't a concrete understanding for everybody...Everybody brings his opinion, and you try to hear from everybody, and then on your own, you can make up some decisions. (Fourth-year Student, Department of Architecture)

The studio model also affects assessment practices within FAED, as students are mostly evaluated through design projects and oral critiques, rather than examinations (an assessment practice that remains the norm in other faculties). Theory courses do tend to include a final examination and, in line with KIST's assessment policy, these must include at least one open-ended synthesis question. However, unlike in other faculties in the sample, there is evidence that FAED instructors work with students during the semester to help them improve in their ability to answer such complex questions. As one faculty participant explained,

... at the same time, we avoid a situation where they are getting these questions for the first time in the main exams. So, they get used to these kind of responses...the questions that have anything to do with analysis ... We felt that maybe one way that we could improve that was if they had similar settings, similar questions, similar vocabulary, as often as possible, to build up their vocabulary and also to get them familiar with those terms. (Junior Faculty Member, Department of Architecture)

Such integration between classroom practice and assessment design is likely to increase student engagement and substantially improve student ability to synthesize and apply their understanding of course content.

Evidence of impact

The marked contrast in academic experiences between FAED and the other five faculties in the sample suggested the need for additional analysis of the data pertaining to the FAED case, in order to determine if the apparent differences in pedagogy within FAED had any impact on student learning. Although the small number of FAED participants in the sample prevented any robust statistical analysis of impact, it was possible to explore qualitative differences in student outcomes between FAED and the other faculties in the sample in order to draw some tentative conclusions.

Students entering FAED do not differ substantially from students entering any other faculty at KIST. First-year students in FAED have similar demographic and academic backgrounds to those entering other faculties and are, therefore, likely to enter university with similar levels of critical thinking ability and attitudes toward learning. This lack of significant differences at the point of entry into university made it possible to qualitatively investigate the question of impact in two ways. First, interview responses between fourth-year FAED and non-FAED students were compared in order to identify any potential differences in learning orientations between students graduating from FAED and students graduating from other participating faculties. Second, follow-up analysis was conducted on the critical thinking assessment responses completed by fourth-year FAED and non-FAED students in order to ascertain any qualitative difference in demonstrated critical thinking ability between the two groups.

Differences in approaches to learning

In total, only five fourth-year FAED students took the critical thinking assessment during the first phase of the study.⁶ Of these five, four agreed to participate in either a focus group or an interview during the case study phase. When compared to comments made by other

⁶ All fourth-year FAED students in the sample were students in the Department of Architecture.

students in the sample, the responses of these four students clearly indicate a deeper approach to learning than the approach demonstrated by their counterparts. For example, one FAED student explained how his attitude toward reading assignments changed during his time in the faculty:

Before, I didn't like reading ... But, because I had to do it [at university], I did it. At the beginning, I didn't like it at all. But, finally, because I was forced to do it, I find it's something interesting and teaching also. I was gaining other things outside of the classes, I think. It was good. (Fourth-year Student, Department of Architecture)

Another student participant described the FAED student culture as being one in which students encourage each other to give maximum effort on their assignments:

Everybody [is] committed, so ... when it is in group works, maybe there are some people who don't work as hard as others do, but we try to talk as a group and say, "you know if you're tasked this one, you have to come up with this information!" And among ourselves in the group, we are able to organize ourselves, so that...we get our best. (Fourth-year Student, Department of Architecture)

Such attitudes contrast sharply with the perspectives of graduating students from other faculties. In one of the focus groups, the majority of students from other faculties agreed that group activities represented an opportunity for 'free marks,' as students could simply pay a stronger student from class to complete the work for them. However, the two FAED students within the focus group protested this representation, arguing that group work was a challenging and important part of their academic experience. When asked about their perceptions of university more generally, student participants from other faculties gave accounts typifying a 'surface' approach to learning, as can be identified in the following indicative example:

I think that a student at KIST is more interested in hearing about their scores. We want to know if we succeeded or failed, to know how much effort we need to use ... If you've survived [without a] supplementary [exam], then you don't care about [getting a low mark]. (Fourth-year student, Faculty of Engineering)

In contrast, FAED participants demonstrated a sophisticated understanding of the various components of their academic program and indicated high levels of motivation to learn, e.g.:

[Assignments] are like another part of the course. Because, I can say the course is a half and the assignment is also another half, so both together, they form the whole. So, if you miss the assignment, it means you miss half of the course, so... It's really something important, and I think everybody understands why this needs to be done like that. (Fourth-year student, Department of Architecture)

Such differences in student attitudes were also noted by some of the faculty and administrator participants in the study. One faculty member from FAED explicitly identified a palpable change in the motivations of incoming and finalist students in the faculty:

... you [can] see from the [graduating] class that ... money, as an end in its self ... has now stopped being the main focus [of their university education]. ... I think they get more than they even imagine when they're coming in... And we see that with the way that they grow up and what they become. (Junior Faculty Member, Department of Architecture)

No participants from other faculties described such a transformative process. In fact, when asked to reflect on how he had changed as a result of his university education, one fourth-year student from another KIST faculty claimed, ‘No one cares if you learned anything. Just you have to have the paper.’ Other faculty and administrator participants also shared anecdotal evidence of differences between FAED students and those from other faculties at KIST. For instance, when asked whether students in FAED were prepared for their final-year project, one faculty participant mentioned the following incident:

[In FAED] we introduce [our students] to Research Methods [early in their undergraduate career]. And we had the best reports in KIST come from our department! Even the Vice Rector Academic and the Quality Assurance, they took our reports just to share. Actually, it was the first time that they’d seen such reports in the whole institution. (Senior Faculty Member, Department of Creative Design)

The senior KIST administrator interviewed for the study, who teaches students from across the university, also noted that there was a large ‘difference’ in the engagement level of FAED students in her modules when compared to those from other faculties.

In the aggregate, these data suggest that there is a marked difference in student engagement levels and approaches to learning between fourth-year FAED students and students graduating from other faculties at KIST. This, in turn, suggests that the academic experiences cultivated within FAED are indeed having a positive impact on student learning within the faculty.

Differences in critical thinking ability

In addition to increased levels of student engagement, it seemed likely that FAED students would demonstrate greater gains in critical thinking ability than students from other participating faculties, given their exposure to pedagogical practices found to improve critical thinking in other contexts. Unfortunately, it was not possible to formally test this assumption, as there was an insufficient number of fourth-year FAED students in the sample to allow for a statistical comparison of assessment scores between fourth-year FAED students and fourth-year students from other faculties. However, it was possible to investigate whether FAED students demonstrated a qualitatively different level of critical thinking ability in their assessment responses from other students in the sample. Following the principle of case–control analysis (Tolmie et al. 2011), the assessment responses written by the five fourth-year FAED students in the sample were compared to the responses of five fourth-year students from other faculties at KIST who ‘matched’ the FAED group on a number of background characteristics. Although perfect matches could not be identified given the small size of the sample, most cases matched on all but one variable. The matching profile is outlined in Table 1.

Once paired, basic content analysis was performed on the ten matched responses. Responses were analyzed against three criteria, all of which relate to the participants’ use of evidence when evaluating and making arguments. The criteria were developed from one of the Kuhn’s early studies, in which she assessed the ability of adults to make an argument—or evaluate the strength of other peoples’ arguments—about ill-structured problems (Kuhn 1991). In Kuhn’s study, participant responses were classified in terms of the type of evidence used to support an argument (i.e., actual evidence, ‘pseudo-evidence’ or no evidence) and the consistency of the argument. Kuhn’s study also examined the epistemological orientation represented by each participant’s response. In this regard, Kuhn classified participant responses into three epistemological categories (ibid., p. 173):

Table 1 Characteristics of matched pairs for case–control follow-up analysis

Pair	FAED student	Non-FAED student	Matched characteristics	Non-matched characteristics
1	Male fourth year	Male fourth year	Same secondary school background; Both missing socio-economic status (SES) quintile	FAED student = parents with tertiary education; Non-FAED student = parents with secondary education
2	Male fourth year	Male fourth year	Same secondary school background; Same SES	FAED student = parents with secondary education; Non-FAED student = parents with primary education
3	Male fourth year	Male fourth year	Same secondary school background; Same family background	FAED student = highest SES quintile; Non-FAED student = second-to-highest SES quintile
4	Male fourth year	Male fourth year	Same secondary school background; Same family background	FAED student = highest SES quintile; Non-FAED student = second-to-highest SES quintile
5	Female fourth year	Female fourth year	Same family background	FAED student = urban public Sec. school + highest SES quintile; Non-FAED student = urban private sec. school + second-to-highest SES quintile

‘absolutist’ responses (in which arguments are presented with complete certainty, reflecting participant belief in knowledge as being factual and certain), ‘multiplist’ responses (in which arguments are presented with certainty but as opinion, reflecting participant belief in knowledge as being individual and subjective), or ‘evaluative’ responses (in which arguments are presented as reasoned judgments, based on evidence but also acknowledging limitations, reflecting participant belief in knowledge as a human construction which is modifiable as new evidence emerges). Given the parallels between Kuhn’s study and the structure of the critical thinking assessment used in this study, these criteria were seen to offer a valid alternative method for evaluating the assessment responses.

Although there was no obvious difference in the consistency of responses written by FAED and non-FAED students, a difference could be identified in terms of both the respondents’ use of evidence and their epistemological orientation. The FAED responses were generally stronger in terms of their use of evidence, as they were all less likely to rely on anecdotal evidence to make claims. While many of the FAED responses referenced anecdotal evidence, all of them used the anecdotal evidence to support claims substantiated by other, more legitimate, evidence sources. In contrast, all five of the non-FAED responses made at least some claims which were either entirely unsupported or were supported exclusively by anecdotal evidence. In terms of epistemology, all ten of the assessment responses reflected an ‘absolutist’ orientation, as they indicated a belief that knowledge is certain and that information obtained either through direct observation or from an authority should be believed to be true. However, three out of five FAED responses demonstrated a more sophisticated epistemological understanding of knowledge, as they also exhibited some comfort with the idea of temporary uncertainty, acknowledging that not everything is known at the present moment. Although not suggesting that knowledge *itself* might be uncertain, these responses reflected an understanding that the

search for more information helps to improve knowledge about a given topic and that this process of searching renders knowledge temporarily uncertain. In contrast, all five non-FAED students discussed the information included in the documents—as well as any knowledge obtained through their own direct observation—as being certain, absolute and unchanging.

These results are not entirely conclusive, as the FAED students did not outperform the non-FAED students in every category. However, in the aggregate, the FAED students could demonstrate more sophisticated skills of argument than students from other faculties at KIST. Although the results are only tentative, given the available sample size, this evidence does suggest that the educational practices implemented within FAED are having a positive influence on the development of critical thinking in the student population.

The mediating influence of departmental culture

The results from the FAED case study are encouraging for other institutions considering pedagogical reforms on their campuses. However, in order to extrapolate any implications from the FAED case, it is important to consider how FAED has managed to create such a markedly different academic environment from the other participating faculties in the study.

FAED is not a typical faculty in many respects, so its success can, at least in part, be explained by a number of inherent characteristics that set it apart from other faculties in the sample. Perhaps most importantly, the faculty was only recently established.⁷ As a new faculty, FAED has been able to develop an entirely new curriculum, benefiting from the gradual year-by-year increase in students to pilot new courses and experiment with instructional techniques. It is, in many respects, easier to build a new program than it is to change an existing curriculum with an entrenched pedagogical approach. Furthermore, as FAED subjects were not previously taught in Rwanda, all of the faculty members completed their training outside the country. As a result, there is no established ‘norm’ within the faculty as to how the content ‘should’ be taught. One faculty participant argued that it was this diversity of backgrounds that enabled the creation of such an atypical learning environment within FAED. The same participant also postulated that most lecturers in the faculty came to Rwanda with the explicit purpose of teaching at KIST, suggesting that instructor motivation may be higher in FAED than in other participating faculties. FAED is also one of the most highly resourced faculties in the sample. As a new faculty, FAED has benefited from a significant amount of start-up funding, which may or may not continue in the future. Studio courses cost more money to implement than lecture-based courses, and administrators acknowledged that it would be difficult to find sufficient funding to support all faculties at a similar level. In addition, participants from other faculties indicated that FAED has the advantage of a particularly low student-to-faculty ratio. Departments in FAED typically accept only 25–30 students per year, while other departments at KIST, such as Computer Engineering, accept up to 70 students per year. Although some departments are clearly burdened by large numbers of students, a detailed analysis of student-to-faculty ratios revealed that the ratio within FAED is not disproportionate for the KIST campus. Some of the science departments, for example, accept even fewer students than FAED each year (KIST Office of Planning and Development 2012). The student-to-

⁷ FAED started accepting students in 2009.

faculty ratio in itself, therefore, does not appear to be a sufficient explanation, although there is no question that many of the methods are easier to execute with smaller class sizes.

Although all of these characteristics are likely to have contributed to the positive academic environment within FAED, comparative analysis of the data from the six participating faculties suggests that the most important difference between FAED and the other faculties in the sample is the departmental culture. Specifically, three aspects of the culture within FAED emerged as playing a particularly important mediating role: (1) the collegial nature of the working environment; (2) the faculty's focus on the exploration, rather than the transmission, of knowledge; and (3) the existence of a culture of shared learning within the faculty.

A shared understanding of the academic experience

Faculty participants from FAED described a highly collegial working environment within the faculty. When the faculty was first established, all of the program curricula were devised collaboratively, incorporating contributions from all faculty members within a given department. By actively soliciting the opinions of other lecturers during the establishment of program curricula, departmental leaders are likely to have cultivated a shared understanding of the objectives of each program and a shared vision of how individual program elements should work together toward the accomplishment of program goals. Participants also described a culture of continuous improvement within the faculty, in which departmental leaders frequently organize opportunities for lecturers to propose revisions, both to the overall program curriculum and to individual module components. As one senior lecturer explained,

Before we start teaching, every semester, we ... share with the rest of the team ... what you're going to teach in this module, why you think it's relevant, how it's filling in the main vision or the purpose or aims of the department. So, we evaluate that. We give you feedback. We discuss. And then we give you time to go and sort-of improve on that. ... we believe then what you're going to teach is a little bit more comprehensive, as opposed to just one person's thoughts. (Senior Faculty Member, Department of Creative Design)

Faculty participants also described sharing examples of good practice with one another, by observing one another's teaching and providing constructive feedback.

Such collaborative working patterns are likely to foster the kinds of faculty attitudes and behaviors that support student learning. In addition to ensuring that curricular content is cohesive and interconnected across modules, collegial working relationships can help faculty members develop strategies to counter student resistance to constructivist approaches (Tsui 2002). Peer observation and informal discussion of pedagogical norms within a department can also act in the place of explicit pedagogical training by collectively bolstering faculty understanding of less traditional teaching methods (Teeter et al. 2011).

Epistemological orientation of the faculty

The programs within FAED have also been constructed with the explicit intention of encouraging students to explore knowledge within their field. Such a focus on the 'unknown' stands in stark opposition to a 'knowledge transmission' approach to teaching (Kember and Gow 1994), whereby teachers view their role as being primarily one of

sharing knowledge with students. Interviews with lecturers in the other participating faculties indicated that knowledge transmission orientations are dominant elsewhere at KIST, as all of those participants claimed that their primary teaching responsibility was to cover course content and ensure student understanding of core information. In contrast, all of faculty participants within FAED demonstrated a “learning facilitation” orientation (ibid.), arguing that their primary responsibility was to foster independent thought and creativity by encouraging students to think in new ways and propose new “design solutions.”

The focus on exploration of the unknown as a key learning objective of all FAED programs is likely to support the development of the ‘meta-knowing competences’ involved in critical thinking by challenging students to test their epistemological understanding and practice their metacognitive skills (Tsui 2000). Furthermore, it is probable that the general emphasis on exploring what is unknown has influenced the teaching orientations of lecturers across the faculty. Teaching orientations have a significant impact on pedagogical practice, as the choices made by lecturers within classrooms are largely driven by their beliefs about both the purpose of education and their role in the learning process (Baxter Magolda 1999; Tabulawa 2013). Indeed, in the other participating faculties, teaching orientations were identified as one of the most substantial barriers preventing the successful implementation of KIST’s centralized pedagogical reforms, as lecturers in the other faculties were found to be adapting the language of the centralized reforms to suit their pre-existing understandings about the practice of teaching (Schendel 2016). The ‘learning facilitation’ orientation evident across FAED, in contrast, is well-suited to the constructivist pedagogical approaches most likely to foster critical thinking skills and is likely to be fostered through the faculty’s collective emphasis on supporting students to explore what is unknown in their field.

Creating a culture of shared learning

Finally, it appears that lecturers and students within FAED work together as partners in the learning process, both within and outside the classroom. The required studio courses in FAED, in particular, cultivate such an environment, as both instructors and peers give feedback on presented designs during oral critiques. This process validates student perspectives and positions the instructor as an expert resource, rather than an unapproachable authority figure. Participants also indicated that critiques are often given by more than one instructor, a practice which allows students to see that ‘experts’ do not always share the same opinion and reduces the tendency for students to look for one ‘correct’ answer or perspective. Within the Department of Creative Design, instructors run a weekly ‘Open Studio,’ in which students are invited to share their work with any instructor in the department. Such a practice is likely to encourage students to interact with all members of the departmental community, while also allowing for engagement with multiple perspectives and design preferences.

There are also myriad opportunities for interaction beyond the traditional classroom boundary. FAED sponsors a number of annual student competitions and events, in which students are publicly rewarded for exemplary work. For example, during data collection, a gallery space was opened in which student work was exhibited for members of the public. Such initiatives are likely to foster student engagement and deeper approaches to learning, as they acknowledge students as respected members of the faculty community while also offering a tangible benefit to in-depth understanding of course objectives (Kuh and the DEEP Project 2005).

Perhaps most importantly, faculty participants from FAED universally indicated a belief in the ability of their students to exceed expectations and demonstrate high levels of proficiency and independent thought. In contrast, although some participants from other faculties indicated a similar belief in their students' abilities, many described their students as generally 'lazy' or lacking in 'seriousness.' Such attitudes imply a lack of belief in student potential, which is likely to result in low student confidence and a lack of connection between students and instructors. Prior research has indicated that instructor belief in student potential is one of the most important factors influencing student critical thinking ability (Tsui 2001). The mutually respectful and supportive environment within FAED is, therefore, likely to be a significant factor influencing student outcomes within the faculty.

Conclusions and Implications

The results of this study can only be viewed as suggestive, as the evidence pertains to one institutional case and relies on a small sample of participants. However, the findings highlight a number of important implications for higher education reform efforts elsewhere in Rwanda and, potentially, the region.

First, the results of the case–control analysis suggest that the pedagogical approaches outlined in the literature do have the potential to positively affect both student engagement and critical thinking ability within an African university context. This is an encouraging sign for other institutions that may be considering similar strategies to improve learning outcomes. It also offers an alternative to the persistent narrative of 'declining quality' that dominates the literature on African higher education, by highlighting at least one example of a faculty which has had some success in improving the quality of teaching offered to its students.

The case study also highlights the importance of institutional culture in supporting pedagogical advances within universities. It is clear that the entirety of the FAED model would not be replicable across all institutional contexts. The specific methods of teaching prevalent within FAED are specific to the academic disciplines taught within the faculty and also require substantial resources, both human and financial, which are likely to be in limited supply at many universities. However, the case does offer broadly applicable insights into localized dynamics that can have a positive effect on student learning. In particular, the case highlights how lecturers within departments can support one another to create learning environments in which students are exposed to divergent perspectives and taught to value the process of exploring what is unknown in their field. Such institutional values are not discipline specific and, importantly for many universities in Africa, are equally likely to affect the approach taken to pedagogy within large and small classes. Institutional culture is often mentioned as an important variable in studies of higher education from other cultural contexts. However, it is virtually non-existent in the African higher education literature. This study highlights the importance of considering the crucial mediating role played by institutional culture when examining complex processes of organizational change within African universities.

There is a danger that massification of access to higher education across the region, although welcome from a social justice perspective, will merely serve as a credentialing exercise, unless universities are able to support their growing student populations to develop the skills and competencies necessary for a productive and fulfilling life beyond graduation. This study offers some initial data on institutional norms that seem to support

the development of effective pedagogical models within African universities. Given the limited scope of the study, further research is clearly needed in this area. However, the emerging results from this study suggest that improvements are already occurring and should be both acknowledged and supported.

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