11-26-2014

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Publisher Citation

Aktas, C., Whelan, R., Stoffer H., Todd, E., Kern, C. (2014). Developing a University-Wide Course on Sustainability: a Critical Evaluation of Planning and Implementation. Journal of Cleaner Production 106, 1 November 2015, pp. 216–221.

Comments

This is the author's accepted manuscript. The final publication can be found at Elsevier via http://dx.doi.org/10.1016/j.jclepro.2014.11.037.

Developing a university-wide course on sustainability: A critical evaluation of planning and implementation

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Abstract

Sustainability is an issue of increasing importance in today's world. Institutions of higher education are undergoing change towards incorporating sustainable development principles within their teaching, research, service, and community outreach efforts. This article presents a case study of the development and implementation of one such initiative: a university-wide freshman course centered on the topic of sustainability. The objective of the course was to expose freshman students to important sustainability issues in a common course team-taught by faculty from various disciplines. The article presents experiences and recommendations as a guide to administrators, faculty and researchers at other institutions of higher education that plan to undertake similar endeavors. Based on experiences with the course, it is recommended that institutions that attempt a similar course should allocate significant time to develop the course, ideally a year in advance. The course concept was predicated on faculty members from widely differing disciplines coming together to teach a cluster topic. While this led to an interesting diversity in perspective, and introduced students to the multi-dimensional aspects of sustainability issues, it also resulted in divergent expectations among faculty and a lack of coherence in achieving the goals of the course initially set forth. A mechanism needs to be in place to coordinate faculty and their lectures within a cluster, and to prevent divergent expectations. An additional challenge that should be taken into consideration is the level of preparedness of freshman students to participate in a course that required high levels of critical thinking and analysis. In conclusion, the course has much potential to create a culture of caring for sustainability issues at an institution, as well as being a bonding experience for incoming freshmen. However, some restructuring is necessary to nurture the students to the point where they can engage in meaningful discussion of sustainability issues.

Keywords: higher education; sustainable development; common course; team-taught; freshmen; multi-disciplinary

Highlights

- Developed a novel interdisciplinary team-taught sustainability course for freshman
- Course development required significant time to discover common ideas among faculty
- Limited prior knowledge of students hindered engagement in meaningful discussion
- Course structure may have required critical thinking too advanced for freshman

1. Introduction

Institutions of higher education are undergoing rapid change due to the need to provide for a new generation of incoming students, to incorporate technological advances in teaching methods, and to focus on growing concerns over global sustainability issues (Cortese, 2003; Lozano, 2006; Lozano and Young, 2013c; Lozano and Lozano, 2014; Velazquez, 2005). Institutions that fail to adapt quickly to change may experience declining demand for their programs and associated student enrollment. In addition, it is desirable that graduates leave the academic world and enter the workforce with clear insight into the importance and future challenges of sustainable living. Many institutions of higher education have therefore included sustainability as a core part of their teaching goals and mission statements with the objective of creating a better foundation for students entering society and the 21st century marketplace (Rowe, 2007). However, any curricular change, including development and inclusion of mandatory sustainability studies, is not a simple undertaking and few have truly succeeded (de la Harpe and Thomas, 2009; Jones et al., 2008). This case study critically analyses the planning of and the challenges encountered during implementation of a university-wide common course on sustainability. Sustainability education is significantly different than traditionally established disciplines in terms of its broad-based and multi-disciplinary content. Teaching sustainability requires new approaches to and new formats for content delivery (Brundiers et al., 2010; Cortese, 2003; Kates et al., 2001). The initiative described here was a novel approach to deliver sustainability ideas and concepts to the broader student body.

This article critically analyses the development and implementation of a university-wide, team-taught course on sustainability entitled *Sustainability and the Ideas of the Future*. The goal of the initiative was to raise awareness of sustainability issues via a mandatory common course for incoming freshman students. The university-wide common course was also viewed as a way to distinguish the University of New Haven from its peer institutions by promoting a common educational experience among all incoming students thereby creating a common link of enhanced social consciousness.

The intent of this article is to present a case study of pedagogical and organizational issues that arose during planning and implementing a team-taught university-wide common course on sustainability, and to offer recommendations for colleges and faculty in other institutions that plan to undertake a similar endeavor. To this end, there are valuable lessons to be learned and taken into account before attempting a similar course.

2. Development of sustainability studies in higher education

Universities have historically been agents of societal change even though they have remained traditional institutions (Lozano et al., 2013a; Stephens and Graham, 2010). Still, most higher education institutions focus on producing graduates from single disciplinary perspectives (Elton, 2003; Lozano, 2010; Oksen et al., 2009). Sustainability became prominent after the United Nations Conference on Environment and Development Rio Summit that was held more than 20 years ago. Yet, it is debatable how much progress has

truly been made towards incorporating sustainable development into higher education (Barth et al., 2014). A paradigm shift is unlikely until sustainable development is diffused and implemented throughout the entire university system (Lozano et al., 2013b).

There are numerous international initiatives (e.g. the United Nations declared 2005-2014 the Decade of Education for Sustainable Development) and national efforts to promote sustainability in higher education (e.g. the Higher Education Sustainability Act of 2007 that authorized a $50 million grant program under the U.S. Department of Education to fund projects to educate future scientists and engineers in sustainability). Wals (2014) indicates that a gradual change in higher education institutions towards sustainable development took place in recent years. Nevertheless, the pace at which the principles of the three pillars of sustainability – environment, economy, and society – have been integrated across traditional disciplinary boundaries has been neither robust nor sufficient to create a fundamental global change in outlook and understanding about the issue (Arbuthnott, 2009; Hopkins, 2012; Stewart, 2010; Tilbury, 2012). Still, significant efforts have been made in achieving progress towards this goal. The number of higher education institutions that have incorporated sustainability into their curricula has risen in the last decade (Lozano, 2010), and others are exploring various means to integrate sustainability into their curricula (Rusinko, 2010). Various researchers have proposed a variety of methods to incorporate sustainability into the curricula of higher education at the course, program, or university level (Bremer and Lopez-Franco, 2006; Ceulemans and De Prins, 2010; Pappas et al., 2013; Rusinko, 2010; Savelyeva and McKenna, 2011; Stewart, 2010, Watson et al., 2013). Others have recommended a complete restructuring of universities to tackle the challenging and increasingly complex problems of the 21st century (Elton, 2003; van Weenen, 2000).

Desha et al. (2009), for example, discuss the need for engineering programs to include specific sustainability elements within their curricula and state that failure to do so may expose programs to additional risk in a rapidly changing industry, regulatory, and accreditation environment. These problems certainly should not be seen as limited to engineering programs, but should be seen in the context of higher education institutions as a whole, which may also be affected by the degree and level of sustainability education that they incorporate.

Lozano et al. (2014) present the five main approaches commonly discussed in the literature to incorporate sustainability into the higher education curricula. These approaches range from coverage of some environmental issues in an existing course, to developing a specific sustainability course, to developing an undergraduate or a graduate program for sustainability. While several examples of such initiatives exist in published literature, the presented case is unique as the developed team-taught interdisciplinary course was offered to all incoming freshman students, and also provided a framework for faculty to share and disseminate their knowledge on sustainability to other faculty teaching the course.

Change in higher education towards sustainability is not an easy task. As Velazquez et al. (2005) point out, there are numerous factors that could obstruct the implementation of sustainability initiatives in higher education institutions. The study also indicate that

academic literature on sustainability in higher education usually focuses on positive experiences and accomplishments while playing down problems and challenges observed as part of the implementation process. In relation to this, the goal of the article is to shed light on challenges encountered during developing and administering an interdisciplinary team-taught common course on sustainability so that other practitioners and educators can benefit from these experiences.

There has been an increasing focus on the concept of sustainability and the incorporation of sustainability education into the curriculum at the institution level before this course was developed. Several significant initiatives to increase sustainability teaching and research have been put forward at the University of New Haven, located in West Haven, Connecticut, USA. It has around 4,800 undergraduate and 1,700 graduate students (UNH, 2014a). A stand alone, interdisciplinary Sustainability Studies degree program was instituted in 2010 (UNH, 2014b). The following year, a research cluster on sustainability was formed as a focal point for faculty interested in sustainability issues, with the goal of fostering collaborative research among the faculty. The support and efforts of the University senior management, including the President, Provost, and Deans, led to a novel initiative of developing a common undergraduate course with a focus on sustainability for incoming freshman students. This article reports on the experience of a group of faculty in developing and implementing this course.

3. Course development and structure

In order to guide researchers elsewhere, detailed information on how the course was developed and structured, as well as course goals and learning outcomes are described in this section. Descriptions presented herein could provide starting points for faculty considering developing sustainability courses having similar aims.

3.1 Course Origins and Development

The original planning group for the course consisted of five faculty members, with each college of the university represented by at least one faculty member. The planning group met several times during Fall 2012 and Spring 2013 semesters to develop a framework for a 15-week semester-long common course. The course was developed with the intention that it would eventually become a mandatory course for all incoming freshman students. A pilot run, where the course was an optional component of the freshman curriculum, was deemed necessary for the first year. During its first semester, the course was to have 400 students but ran at 74% enrollment capacity.

Twenty full-time faculty members volunteered to teach the course in the Fall 2013 semester. The course ran in four clusters with five faculty members per cluster. Fig. 1 provides a schematic of the four clusters and the responsibility of each group during course development. Each cluster consisted of faculty from a wide range of programs. Following the proposal of several different topics, three were chosen: The Future of Energy, the Future of Food, and two clusters on the Future of the American City. All twenty participating faculty members met several times towards the end Spring 2013 semester and over the summer to discuss the structure of the course. The original plan was for a

portion of each cluster's focus to be common. With this goal, the initial planning group identified a list of common readings on the issue of sustainability. However, it proved difficult to develop a common set of readings that would satisfy twenty different professors from many different disciplines. It was concluded that while the readings were all potentially appropriate, their length would have controlled the course and so the idea to have common topics and readings between the four clusters was abandoned.

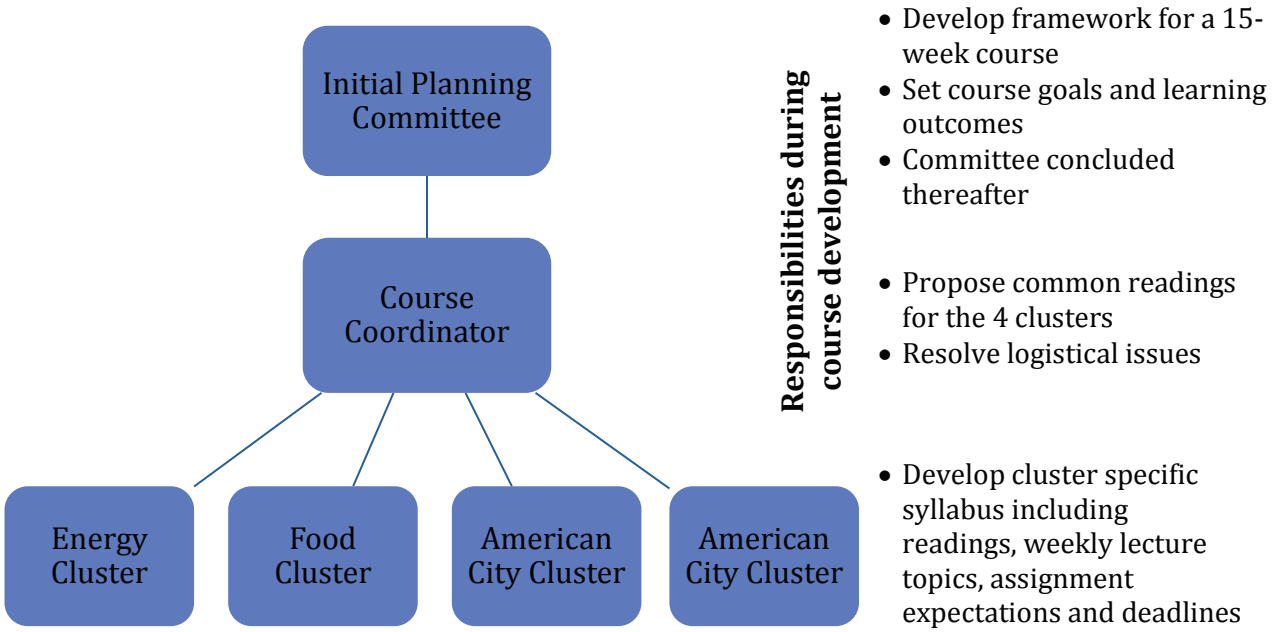

Fig. 1. Diagram illustrates administrative steps used during course development, together with their responsibilities and contributions.

3.2 Course Goals and Learning Outcomes

Course goals and learning outcomes were developed by the original planning committee and were common to all four clusters. It should be noted that learning outcomes for the course were chosen in support of findings of other researchers who have outlined desired traits of sustainability course learning outcomes (Brundiers and Wiek, 2011; Svanström et al., 2008).

Course Goals:

1. *Compare and contrast different—and occasionally contradictory—notions of sustainability through the lens of multiple academic perspectives.*
2. *Expose all first-year students to a variety of academic disciplines and modalities of intellectual discourse with an emphasis on pressing problems.*
3. *Foster scholarly and intellectual exchange among students and faculty members that highlight the importance of interdisciplinary curiosity.*

Learning Outcomes: Upon successful completion of this course, students will be able to:

1. *Articulate, synthesize and critically evaluate various ideas of sustainability and how they relate to global, national, local, and individual themes.*
2. *Evaluate problems associated with energy production, consumption, and policy development.*
3. *Write analytical and argumentative essays applying relevant theoretical and disciplinary frameworks to specific questions relating to the theme of energy sustainability.*
4. *Effectively collaborate on written projects and oral presentations in teams which bring together students of diverse backgrounds and interests.*
5. *Formulate a critical vocabulary for assessing claims made in the name of sustainability.*

3.3 Course Structure

The course was structured such that each cluster would have 100 students meeting together for a common lecture or panel discussion for one 75-minute period a week. All five instructors would facilitate the large group panel discussions. For the second 75-minute weekly meeting, the large group of 100 students would be split into five sections of twenty students, each meeting with an individual faculty member. The small group meetings were intended to be an opportunity to discuss and analyze the large group presentations and assigned readings.

The authors of this article are members of the Future of Energy Sustainability cluster, one of the four clusters within the Common Course. The energy sustainability cluster consisted of five faculty members, each from a different department within the University: one from Science and Technology Studies (STS) with an interest in the building of large technological systems (including energy-focused technology); one from Education whose expertise is in translating the cognitive and affective processes related to how people learn into meaningful teaching practices in science education; a political scientist from the National Security Program who spent a career in the U.S. State Department and the United Nations; a civil engineer who also coordinates the Sustainability Studies Program and whose expertise is on incorporating sustainability into the built environment; and a biologist who coordinates the Biochemistry and Biotechnology programs. The major challenge facing the energy cluster was to form a coherent and logical course structure with the limitation of the areas of expertise and interest of each of the faculty members of the cluster.

The original planning committee had developed an outline syllabus, which was used by all four clusters as a template. Concurrently, starting in May 2013 and continuing through the summer at irregular intervals, the five faculty members assigned to each cluster met several times to plan the class. The goal of these meetings was for each cluster to agree on specific readings, weekly lecture topics, common assignments, common deadlines for student work to be submitted, and develop a cluster specific syllabus.

The energy group determined that each member would take responsibility for two of the large group, common lectures, and that the remaining five common lectures would be

jointly facilitated by all five faculty members. The STS faculty identified several different topics and associated literature, which was proposed to the other members of the cluster.

The STS faculty member hoped to merge approaches from the history of technology that stressed the development of large-energy consuming, producing, and distributing systems (Högselius, 2013; Hughes, 1979; Nye, 1999) with approaches concerning sustainability (Dietz et al., 2003; Ostrom, 1990; Kaijser, 2002; Disco and Kranakis, 2013). The stress on history of technology was meant to support the engineer. The engineering faculty member also was given suggestions concerning the built environment, which was one of his interests (Raines, 2011). Ostrom's (2005) stress on institutions and governance was intended to integrate political science into the course. Various biological solutions to sustainability were seen as a way to engage the biology faculty. Although the literature in science and technology studies has not had a significant impact on STEM education (McGinn and Roth, 1999), the faculty hoped benefit from new ideas and trends concerning education, thus brought along by the education faculty member. This approach provided a starting point, which other faculty then adjusted to suit their own backgrounds and interests and proposed readings that complemented their topic of choice. In the end, there were multiple readings assigned under each week related to that week's topic.

It was determined that, in accordance with the course design developed for all four clusters, the students would demonstrate their understanding of the weekly readings by submitting short (100-200 word) reading responses each week before the small group class. It was additionally intended that these reading responses would provide the framework for the weekly small group discussion meetings.

While trying to ensure that students maintained their efforts with the assigned readings and lecture materials, each faculty member employed a slightly different approach to facilitate the small group. One gave short weekly assignments based on that week's assigned readings by asking students to summarize them and provide three questions to promote discussion. Another section required students to post their reflection on Blackboard for the assigned readings, where the required post length was 1-2 paragraphs. As the semester progressed a Facebook group was created for students to post websites related to the weekly readings as well as to participate in asynchronous discussions on the week's readings.

A key objective of the course was to improve communication skills. To this end, all five professors assigned three 500-word essays, each due at the same time during the course to evaluate student progress. In addition to essays, a final term project was also included in the course for students to gain a deeper understanding of a topic of their choice. The content of this project was to be decided by the individual instructors. Attendance and participation also formed an important portion of a student's final grade. Since one of the objectives of the course was to engage students in critical thinking and discussion, the importance of participation during class was emphasized at the beginning of the semester and re-emphasized throughout the course.

4. Implementation challenges and coping strategies

Implementation of the university-wide common course on sustainability faced challenges at multiple levels. At the curricular level, existing programs were reluctant to accept a new mandatory course as it would either mean displacing another course in their curriculum, or increasing the number of required credits for graduation. Neither would be popular. As described previously, development of the course followed a top-down approach and the initial support of university senior management was vital to getting the course organized and implemented.

From a course planning perspective, it became evident when the cluster meetings started at the end of the Spring 2013 semester that the time and effort needed to successfully develop the course were significantly underestimated. Preparing a common syllabus for the cluster was quickly recognized to be a challenging task due to the broad nature of the topic and the need for five faculty members to reach an early and enduring consensus.

Relying on one special field (STS) to identify topics and readings did not work very well. A semester of working together and reading each other's preferred literature led the instructors to recognize the significant differences in training and interests among faculty with such diverse backgrounds. Four faculty in the energy cluster discussed the course over the summer, and one faculty began working at the university just before classes started. A much longer period of interaction was needed before the course began. It would have been possible to arrive at reading assignments that were of similar difficulty and length. Integrating topics in a much more cogent manner could also be achieved, together with developing the common lecture meetings in a more integrated fashion. Several instructors provided historical depth in lectures, but the periods and issues were not well enough integrated. None of these efforts to integrate five disciplines should be attempted in a short period. Since all instructors promoted reading, discussion, writing, and research, students benefitted, but building a team from five disciplines proved to be more difficult than initially anticipated.

Even though all faculty members within the energy cluster had prior experience teaching courses in their own respective fields, they had different backgrounds, teaching styles, and expectations for students. Such variations resulted in difficulties in determining common readings, assignments, and objectives for the cluster. While preparing the syllabus, it was decided to keep the difficulty of readings and assignments consistent among sections within the cluster, but to allow implementation of the assignments to vary depending on the instructor's judgment.

Perhaps the most significant challenge encountered in teaching the course was instructing the individual discussion meetings of twenty students. One of the goals of the common course was for students to gain the ability to critically evaluate and exchange interdisciplinary ideas with their peers and instructors. The individual discussion meetings were commonly viewed as the appropriate setting to achieve this goal. While preparing for the course over the summer, main efforts focused on developing common lecture topics and associated readings for them. The discussion meetings with twenty students were seen as a way to reiterate important points from the large lecture presentations, analyze and

discuss assigned readings for that week, and emphasize the importance of the week's topic with respect to energy sustainability. Specific planning for these discussions was not developed. Four of the five instructors in the energy cluster reported that students seemed disengaged during discussion meetings, were reluctant to express their opinions, and generally seemed disinterested in discussing ideas emanating from the large lectures. Two major factors were identified as contributing to this lack of participation. Part of the problem appeared to stem from the fact that instructors were compelled to discuss topics that were not within their usual fields of study and on a number of occasions faculty were learning simultaneously with students. The basic problem for students stemmed from the complexity of the topics covered and the reading materials selected to provide background. It is difficult for students to discuss complex issues of energy and sustainability when they have minimal background knowledge. This failure to ignite broad-based student interest is the single biggest shortcoming of the course. Another factor that the energy faculty discussed as contributing to student disengagement was a failure to maintain clearly defined, concrete student learning outcomes for the overall course, as well as for the individual energy cluster. It is, however, an issue that can be resolvable by more careful structuring of the course in future attempts at the course. Increased participation was observed in the latter half of the semester, when students became familiar with the concepts of energy and sustainability.

Although the initial idea was for faculty to utilize similar assignments for the cluster, faculty members soon realized that this was more difficult to plan than to accomplish. Given the challenges faced in the small group discussion classes, it is not surprising that faculty developed different coping strategies to motivate their students. By mid-semester, two professors within the cluster decided to combine their discussion classes to provide a critical mass of students needed for fruitful in-class discussions. These sections also used Facebook to promote interest and debate. Moreover, individual professors assigned different topics for the 500-word essays and different final term projects. In effect, the five energy cluster sections had different assignments and objectives for each of their discussion sections.

For example, the two of the five professors who combined their discussion sections developed a term project that required students to work in small groups to create a public service announcement along with a reflective essay and group presentation. In another professor's class the students worked in groups of three or four to define a topic related to energy sustainability, find relevant material with the help of an embedded librarian, and present a coherent report with an oral presentation. Another section employed a similar report and presentation format but allowed students to either work individually or in groups, mainly because of the smaller number of students in that section.

Implementation challenges described above were not specifically limited to the energy cluster. A midterm meeting was held for all faculty involved with the common course, partly driven by the desire to improve the course for the Fall 2014 semester and partly by comments and issues raised by both faculty and students about the course as it unfolded during the initial semester. Novel ideas to improve the impact and visibility of term projects were discussed during that meeting. Faculty in other clusters also expressed

problems associated with collective action, and a lack of coherence among small group discussion sections. Two faculty expressed concern about understanding the challenges of freshman students and recognizing what freshmen students can achieve in their first semester. The consensus was that while the overall course was based on promoting discussions and critical analyses of significant ideas on sustainability, freshman students may not be developmentally ready for the higher level thinking required to succeed in such a course so early in their college experience.

5. Recommendations and Conclusions

As noted by Velazquez et al. (2005), most literature on incorporating sustainability into higher education focus on successes and achievements and tend to deemphasize the significant challenges and barriers faced throughout the implementation process. This article aimed to present said challenges together with coping strategies in order to provide a guide for other faculty who may attempt similar endeavors.

There is a need for greater integration of sustainability in higher education and to organize university-wide common courses on sustainability as an effective way to share and promote ideas with future generations. While there have been attempts at incorporating sustainable development into the curriculum at the graduate level, or as a course or a series of courses at the undergraduate level, the course presented here is one of the first attempts made to introduce sustainable development at the freshman level as a mandatory course for all incoming students. Rather than catering only to students who come prepared or inclined for sustainable development, if presented challenges can be overcome, the sustainability course has the potential to make a much stronger impact on the mindset of future generations by infusing sustainable development principles early on into the curriculum and therefore may be considered as a model at other higher education institutions worldwide.

Although many hours went into developing the format and structure of the overall course, and preparing a common syllabus within clusters, unforeseen and significant challenges were encountered during implementation of the course during its first run with 295 freshman students.

For faculty or senior management working towards similar projects in other universities, it is recommended that preparations within each cluster start considerably earlier, ideally a year in advance, and that more time be allocated to plan for outcomes and methods of instruction during individual section meetings. Unlike a traditional course within the field of expertise of the instructor, an interdisciplinary team-taught course on sustainability requires significantly more planning before course initiation. In addition, faculty members need time to familiarize themselves with other fields. Moreover, it is important to develop concrete learning goals and objectives, and a plan to reach them before creating a common course syllabus.

Leadership among faculty or some mechanism of governance is essential to commit all faculty involved in a cluster to operate pedagogically in an effective and cohesive manner.

The role of each professor and their method of linking students to the course materials should be clearly defined, and new materials introduced by others should be overseen by one faculty member taking a leadership role in order to preserve coherence of presented materials and learning within the cluster. With these steps in place, a successful common course on sustainability offered to large student populations can be developed and offered.

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