Educating for Collective Intelligence: An SCI Perspective

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1. Introduction

This paper summarizes the thoughts of several members of the UM6P School for Collective Intelligence (SCI) on the challenge of educating for collective intelligence (CI). We will discuss what makes teaching CI important, what makes it unique, as well how to teach CI well.

2. What Makes Teaching CI Important?

One of the key reasons CI is important is *utilitarian*. CI probably represents (barring the singularity) humanities' best chance at effectively addressing the many existential challenges we now face. Many social, political, and global problems are too complex for traditional scientific or technocratic solutions. Collective intelligence can leverage diverse perspectives and collaborative processes to navigate complexity where individual or small group expertise may fall short. Incorporating wider groups in developing solutions also has the advantage of minimizing the resistance to the *adoption* of these solutions, since they will not simply be imposed from on high.

A second key reason is *ethical*. Better CI systems probably represent our best hope for fostering more inclusive, democratic, and therefore ethical decision-making processes. How can we claim to have inclusive democracies if the vast majority of our population has almost no opportunity to influence the development and vetting of the ideas that become policy?

A third key reason is CI's potential *impact on mindsets*. Humanity has had spectacular success with a reductionist and individualist perspective on developing new knowledge, but it is becoming increasingly clear that a more systemic/collectivist mindset is crucial to making further progress. We need to re-think how we view the natural world and human society. For example, is it still useful to view intelligence as primarily an individual phenomenon, or to believe that human progress is largely the result of a few highly specialized and isolated "great men"? If we take a more systemic perspective, this is likely to have profound impacts on how we do education, science, technology transfer, governance, and so on.

2. What Makes Teaching CI Different Than Other Disciplines?

Given the multi-faceted importance of teaching CI, is there anything wrong with following the same teaching methodologies that are applied to other disciplines? Teaching CI, we believe, raises some relatively unique challenges:

- *Extreme multi-disciplinarity*: Collective intelligence (CI) is an extremely multidisciplinary field, drawing from disciplines ranging from physics to biology, anthropology to computer science, economics to cognitive science. How do we teach such a multi-disciplinary topic

when, at this stage in the field's development, most professors have "grown up" within a single discipline? The tendency is to teach CI via a series of single-discipline classes, which can lead to repetition and terminological confusion as well as lost opportunities for students to see how a small set of core concepts can apply in a wide range of contexts.

- *Lack of Teaching Materials*: Because of its relative youth, teaching CI requires creating new learning materials, as existing resources are limited or non-existent. There are for example no established textbooks for CI.
- *An Evolving Discipline*: Teaching CI involves uncertainty regarding employability and future application, which necessitates a dynamic and risk-taking approach. The field of CI is still evolving, so educators are continually figuring out its particular role.

3. How Should We Teach CI?

How can we meet these challenges? There are we believe at least two key components:

3.1. Curriculum Content

Start with the core. We believe it is useful to *define a core set of shared CI concepts and vocabulary* e.g. including such concepts as emergence, game theory, networks, information theory, and so on. We should perhaps teach these foundational concepts *first*, and *then* explore their variegated roles in a wide range of disciplines in subsequent classes.

Teach science as a process. The world of science and technology is arguably humanity's most effective collective intelligence process, but the teaching to aspiring researchers on this topic mainly focuses on *individual* practices (experiment design, statistical analysis) and not on the *collective* practices that are also so critical. We should therefore also teach students about the collective elements of science: how to pick topics in a world with millions of scientists, build upon other people's ideas, communicate ideas, get support for work, strategize about collaborations and intellectual property etc. This should include educating students on the practices of *open* science, since this approach in our judgment better embodies CI principles.

Draw inspiration from the teaching methods of complex systems science, which faces the same challenge of dealing with very multi-disciplinary material.

A personalized journey: CI covers a wide range of disciplines and applications. Different students will resonate with and benefit from different aspects of this curriculum. It is therefore important to provide, as much as possible, a wide range of courses and let students choose their learning paths. We should for the same reason offer students wide latitude in which class projects they do, as long as they are rigorous and CI-based.

3.2. Teaching Practices

There are we believe many potentially productive practices for teaching CI, including;

- *Co-teaching*: Use team-taught classes to reinforce key concepts by presenting illustrations of the same core concepts from multiple disciplines.
- *Use CI to teach CI*: Employ CI principles and tools in the teaching process. For example, we can use CI tools to rapidly gather and respond to student feedback, as well as to enable group

problem solving exercises where the students learn CI concepts by practicing them. An example of this is the flipped classroom approach, wherein teachers provide rich materials for self-study, dedicating class time to peer-to-peer learning processes.

- *Learn by doing*: Engage students in exercises where they are asked to collectively solve problems using the CI principles they are learning. They can do this as problem-solvers or as *facilitators* of engagements involving domain experts.
- *Engage with real-world problems:* CI is deeply relevant to solving many real-world problems. This provides a powerful "hook" for engaging students deeply in its study. We should therefore strive to involve students in projects tied to their personal motivations, which can range from solving humanity's existential challenges to creating CI-based products and services. One way to enable this is to give students contact with professionals in the working world, for example alumni of the CI program, who face CI challenges and use CI solutions.
- *Case study approach*: Apply a multi-disciplinary perspective to analyzing rich examples of existing CI systems, fostering critical thinking and deeper understanding.
- *Multi-disciplinary projects*: Encourage students to do projects incorporating ideas from multiple disciplines.

4. Conclusions

We have clearly only scratched the surface of this topic, but it seems clear that it is worth discussing, since teaching CI effectively (1) involves some unique challenges, (2) probably requires genuine and potentially generalizable innovations in teaching practices, and (3) will probably be pivotal in terms of humanities' ability to deal with its many existential challenges.