

CHALLENGES IN THE TEACHING OF EVOLUTION IN THE LIFE SCIENCES CLASSROOM

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Abstract

This paper reflects on research that was conducted about teachers' views on evolution. This innovation in the curriculum has been met with mixed reactions. Whereas some teachers embrace this new theme, many teachers are opposed to the teaching of evolution. This paper reports on an inquiry that was conducted among 255 teachers in Gauteng and in which survey questionnaires were used to collect qualitative data, which was analysed for its discourse. In addition, personal interviews were conducted with a number of Christian, Muslim and Hindu teachers. The discourse of the teachers shows that many of them cannot reconcile their religious faith with their teaching and that they may teach the facts of evolution, but make sure that they discredit evolution as a theory. Conceptual change theory is used as a lens to interpret the data. Pintrich, Marx and Boyle (1993) state that we often look at conceptual change from a "cold" cognitive lens. These researchers are of the opinion that controversial conceptual change should be viewed from the perspective of hot conceptual change. These "hot" factors include societal factors, religion and the influence of religious leaders, making conceptual change a much more complicated process.

Keywords: Life sciences education; evolution; conceptual change theory

1. INTRODUCTION

The National Curriculum Statement (NCS) and the refined Curriculum and Assessment Policy Statement (CAPS) for life sciences visualize a teacher who is well-versed in concepts such as natural selection, micro- and macro-evolution, as well as biological evidence for evolution. Furthermore, the CAPS expects a teacher to be able to effectively deal with such controversial issues in the classroom, and effectively assist learners in resolving any religious or other objections that they might have. The question arises whether all life sciences teachers are able to comply with the requirements that the NCS/ CAPS assume. Is sufficient support provided to teachers to meet the challenges posed by the national curriculum, and the evolution theme that is now introduced in the curriculum?



The Department of Science and Technology Education, Faculty of Education, University of Johannesburg, conducted research for the Gauteng Department of Education on the

implementation of the new life sciences curriculum, and 255 completed questionnaires were used in the research project. Furthermore, this article also refers to data that was obtained during personal interviews with 12 Christian, Muslim and Hindu teachers. Through triangulation a thick description is provided of teachers' experiences in teaching evolution.

2. METHODOLOGY: THEMATIC DISCOURSE ANALYSIS

The number of received completed questionnaires (n = 255, out of a population of 600 schools that received the questionnaire) is acceptable for this type of analysis, that aims to not generalise, but to provide a description of the phenomenon according to a specific research procedure. Construct validity was determined by including 130 university students in a pilot study, after which small changes were made to the instrument (De Beer & Henning, 2013). We analysed the open-ended responses of the 255 teachers to the items, by making use of a rubric to categorise the language registers of the teachers. The utterances of teachers were analysed according to ten types of discourse and language registers, as can be seen in Table 1. This was done according to Henning, Van Rensburg and Smit's (2004:121) discourse analysis model. Because of the incomplete nature of four returned questionnaires, we excluded these from the analysis that resulted in 251 teachers' data that was used. We looked at these teachers' responses to four statements that resulted in 1004 utterances that were made. From this we made 603 placements, as can be seen in Table 1. These placements are distributed amongst the ten discourse types. The dominating discourse type was the religious register, with the irrational-discrediting and pedagogical discourse types as second and third most common discourse types.

Table 1. Observation instrument for the discourse types of teachers

Level of use  Discourse type and distribution 	Predominant (Four responses)	Strong (Three responses)	Partly (Two responses)	Weak (One response)
Scientific discourse 44	2	4	7	10
Bio-scientific explanations 21	1	2	3	5
Irrational-discrediting 105	6	13	16	10
Avoidance 51	2	7	7	8
Pedagogical explanations 86	4	11	13	11
Religious 145	12	14	19	17

Dogmatic 44	2	4	9	6
Humanistic 34	2	4	4	6
Alienated/ objectifying 26	2	2	4	4
Naïve/ lack of understanding 47	2	4	7	13

We used the number of placings as an indication of the dominant discourse. We used the four categories predominant, strong, partly and weak, to describe the trends. If there were two incidences of a particular teacher who gave four responses in the same category (the predominant category), it resulted in eight placings. As Miles and Huberman (1994) pointed out, such a systematic procedure can result in the effective capturing of the extent of a phenomenon. In paragraph 3.1 we will provide more detailed feedback on the survey, and responses to individual items. This will further be enriched with the emerging themes from the transcribed interviews. Interviews were conducted with ten life sciences teachers of different religious faiths (Christian, Muslim and Hindu).

3. LOOKING AT EVOLUTION AND CONCEPTUAL CHANGE THROUGH A “HOT” LENS

As mentioned above, a survey was done amongst life sciences teachers in Gauteng, and 255 questionnaires were received back.

3.1. Teachers’ responses to Likert-scale items

Table 2 below indicates teachers’ responses to three questions, where Likert-scale responses were required.

Table 2: Teachers’ answers to Likert-scale items (sample size = 255)

Item	Strongly disagree	Disagree	Agree	Strongly agree	Uncertain
It is essential to teach natural selection and evolution	4.7%	15%	45.5%	32.2%	2.6%
Evolution is in conflict with peoples’ religious beliefs	5.2%	18.7%	43%	30%	3%
I follow an intelligent design approach	12.3%	27.2%	31.6%	19.7%	9.2%

(evolution is God's toolbox)					
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Though 77.7% of teachers agreed that it was essential to teach natural selection and evolution in life sciences, 73% of the teachers also indicated that evolution was in conflict with peoples` religious beliefs. It was surprising that 51.3% of teachers indicated that they followed intelligent design approaches when teaching evolution. It is important to note that the 255 teachers who participated in this survey were from different religious groups.

In paragraphs 3.2 – 3.5 teachers` responses to the following open ended statements are discussed:

- I think evolution is...
- My religious beliefs show that evolution...
- I see natural selection as...
- In my teaching of evolution I will...

3.2. Teachers` responses to the question “I think evolution is...”

Teachers who accept evolution explained it in various ways; some answers scientifically correct, and some answers showing misconceptions. Evolution conflicts with some of the teachers` religious beliefs and they do not want to teach it: *“In conflict with my beliefs. I have no passion to teach it”, “Distracting peoples` attention from God”, “Ridiculous”, and “Unnecessary to teach at school level. It confuses learners with other religious beliefs. Content is sketchy and often difficult to understand”*.

Table 3: I think evolution is...

Discursive Register	Statements by teachers	Notes/ discussion
Scientific	Evolution is a theory that can be proven wrong/ Highly debatable scientific theory/ Unable to predict like other theories	Some teachers use a scientific discourse to discredit evolution
Bio-scientific	Changes in species (phenotype) of organisms/ adaptations to environment	Teachers in this category show understanding of the principles of evolution (though there are a number of misconceptions amongst some teachers)
Emotional	Crap/ absolute nonsense / Arbitrary/ Overrated	Teachers do not engage with biological concepts at all, and use emotional arguments to discredit evolution

Elusive	I hate to teach it/ Avoid/ I do not teach it	Teacher does not answer the question/ in some cases do not teach the curriculum
Pedagogical	Too abstract/ too difficult for learners to grasp/ University concept/ Confuses learners and difficult to understand	Teachers use learners' cognitive development as an argument to not teach the abstract concept of evolution
Religious	It distract attention from God/ Humans do not come from monkeys/ Humans competing against God	These teachers feel that evolution is in conflict with religious beliefs
Alienated	Strange concept	Evolution in conflict with world view of teacher
Humanist	People have the right to their own beliefs	Teacher feel that it is an infringement of human rights

3.3. Teachers' responses to the question "My religious beliefs show that evolution..."

First of all, some teachers do not express any particular religious beliefs. Some teachers believe that God is using evolution as a tool to create life on Earth: *"Is part of God's plan and not contradictory to my Christian beliefs"*, *"Evolution confirms the order of God's creation and the fact that primitive organisms came first and more complex were created later like man"*, *"Is a process created by God which allows organisms to adapt to lifestyles and environment"*, and *"It is compatible with the creation. A study of history proves that life is evolving all the time"*. Some teachers believe that evolution is in conflict with their religion: *"cannot link my religious beliefs with evolution"*, *"Is a theory that is against Christianity"*, and *"Contradicts with Bible"*. Some teachers have very negative views of evolution: *"Is nonsense"*, *"It is a sham"*, *"misleading"*, *"Is not telling the truth"*, and *"Is just story for tales"*. One teacher expresses his confusion: *"Confuses me as a Christian. Bible says Earth was created +/- 2000 years ago but here they speak about millions of years ago"*. One teacher separated the religion and science teachings: *"I do not use my religion when I study evolution. I do not scientify (sic) my religion. I teach evolution as science which has got no link whatsoever with religion"*; *"It is not only because I am Muslim but also I am an explorer. I can't believe evolution. I can't find any way that comes to me logical. A few passed cannot convince me"*.

Table 4: My religious beliefs show that evolution...

Discursive	Statements by teachers	Notes/ discussion
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Register		
Duty/ responsibility	I have to teach it	Despite personal objections, these teachers teach the prescribed curriculum
Denial	Evolution does not exist/ did not take place/ flawed theory	Some teachers see the theory of evolution as an onslaught on their religious beliefs (Christianity or Islam)
Conflict	Evolution is playing God/ conflicts with Bible (sin and redemption)/ not reflected in the scriptures	The Bible/ Koran is the foundation of many teachers' faith and they perceive evolution to be in conflict with the teachings of the Bible.
No conflict	Bible not a scientific textbook, but book of faith	These teachers see many of the stories in the Bible as metaphors and not as historical fact. They are able to differentiate between the physical and meta-physical realms.
Intelligent Design	Evolution is possible through God/ 1 day (Genesis) like 100,000 years to God	These teachers seem to have little conflict as they believe God uses evolution as a tool to create.
Excluding humans	Man not part of evolution	Humans are created in the image of God and are therefore excluded from evolution.

3.4. Teachers' responses to the question "I see natural selection as..."

Life sciences teachers have many alternative conceptions of natural selection: "*A way of understanding how individuals or organisms are adapted to their environment and explaining the survival of these organisms*", "*A process whereby the fittest and most well adapted survive*", and "*Survival of the fittest. The ones who can adapt to changes in the environment will survive and in time carry on their genes to the next generations*". Some teachers make the connection between natural selection and evolution: "*A tool for evolution*", "*One of the mechanisms through which evolution occurs*", and "*A process that steers evolution*".

Some of the less satisfactory answers to this question were:

- Classification of things naturally

- Natural habitat of organisms
- Things that never change, like air, soil and water
- When the male hunt for the female during mating.

The above answers flag the important issue that many teachers are not well trained to teach evolution; they do not have a well-developed pedagogical content knowledge (PCK) to pay justice to evolution in their teaching.

Table 5: I see natural selection as...

Discursive Register	Statements by teachers	Notes/ discussion
Natural selection and evolution two different things	Better than evolution	Natural selection more acceptable than evolution theory, showing a lack of insight
Flawed theory	A theory only/ flawed	Lack of knowledge on evidence from various fields in support of organic evolution
Survival of fittest	Survival of the fittest/ surviving in a habitat/ competition/ strong genes	Some teachers use a bio-scientific register.
Mutations	Genetic mutations	Unfortunately very few teachers used such a bio-scientific register.
Change driven by environment	Change of plants and animals to fit environment/ environmental conditions select positive traits	The molecular basis of evolution is not taken into consideration. Selective use of data.
Naïve/ lack of basic knowledge	A natural process/ the way the world works	

3.5. Teachers’ responses to the question “In my teaching of evolution I will...”

Some life sciences teachers are of the opinion that different belief systems should be respected when teaching evolution: *“All learners are to believe whatever they do believe. Discuss belief systems first, so that they don’t have a barrier to learn. Teach it scientifically. I do not impose*

my belief system on them”, “Encourage learners to make up their own ideas taking into account the diversity of cultural and religious backgrounds”, and “Encourage learners to respect other peoples` view points and not impose their belief systems on others.”

Some of them believe that learners should see both sides – evolution and creationism – and make up their own minds: *“Teach all the theories and tell learners to choose for themselves”, and “Teach both sides of the argument – evolution and creationist point of view. Give the students all the facts and allow them to make up their own mind about it”.*

Some teachers` first priority is to assure that their learners pass and to teach the curriculum: *“Teach what is expected of me in order to assure that my learners pass well. However, I will not impose my beliefs nor should they. I purely teach the content in order for my learners to pass”, and “Teach what the curriculum want me to teach and I do not force my beliefs on the children they have to make up their own minds”.*

Teachers supporting creationism, indicate that they share their personal viewpoints with the learners: *“Attempt to show that only although the process may have or may be occurring it has to be driven by some higher power than mere natural selection”, and “Never forget that God did all creation!”.*

Holistic and scientific approaches are vectors to teach evolution by life sciences teachers: *“As a holistical approach, I take my learners to the Palaeontology Department at Wits and to The Cradle of Mankind in Sterkfontein and Maropeng so that learners can have an accurate view of what evolution entails”, and “Adopt a scientific approach. Be careful to allow different interpretations and cultural, religious beliefs. Explain the differences between a theory and a law. Discuss the proof used to explain evolution in an objective manner”.*

Table 6: In my teaching of evolution I will...

Discursive Register	Statements by teachers	Notes/ discussion
Separation	Separate evolution from my religion	Two parallel entities: the science that must be taught, and religious beliefs that are untouched by data seen as being in conflict.
Waiver/ Theology	Emphasize that God created all/ Consistent with God’s will (Higher Hand)	Teachers often feel that they betray God by teaching evolution, and that they need to bring in an Islam or Christian perspective

Discredit	Emphasize gaps in evolution theory	Sometimes use a scientific register, to discredit evolution.
Fundamentalist	Teach that the Earth is 6,000 years old	Literal interpretation of the Quran/ Bible
Inclusive	Respect different views and beliefs	Honouring human rights
Excursion	Demonstrate- take learners to the Ditsong Museum (formerly the Transvaal Museum)	Using different pedagogies
Curriculum driven	Teach according to the curriculum	Not necessarily accepting the theory of evolution.

3.6. Interviews with Christian, Muslim and Hindu teachers

Yalvac (2011) conducted a study focusing on teachers and learners from the Islam faith. He conducted interviews with teachers and learners in four Muslim schools in the Gauteng province. The interviews with learners were conducted before and after being taught the section on evolution. It was found that, as with many Christian teachers and learners, many of the the Muslim teachers and learners had big objections to evolution as they believe evolution to be in contrast with their religion. Many of the teachers that he interviewed were creationists and believe that all life on Earth was created by Allah:

“I believe more in religious rules than in scientific rules. God knows everything of this world and he knows what is best for us. Less important are scientific rules, as Allah is the ultimate being that created us”.

Naude (2013) did a similar study amongst Christian teachers. His study also showed that some Christian teachers are creationists and believe that God created life in seven days as stated in Genesis 1. Whereas Yalvac (2011) found that some of the teachers actively discouraged the learners to accept evolution, it was not the case with the fundamentalistic Christian teachers in Naude’s study. They did not actively discourage learners to accept evolution in their classrooms despite having objections toward it. Below an excerpt from Naude’s (2013) study, in which he describes Cathryn (a pseudonym):

Cathryn sees her role as a teacher solely as an educator who teaches facts. She believes that a life sciences teacher should not teach any religion. She classifies evolution as a religion and should therefore not be taught. She does not have good content knowledge about evolution, and is further of the opinion that evolution is a big conspiracy “of

Satan/UN to mislead Christians”. Her religious objection to evolution is so great that she gives the entire section on evolution as self-study. I therefore doubt if learners in this teacher’s classes are given the opportunity to objectively reflect on evolution. She doesn’t see any value in an excursion to the Cradle of Humankind as they showcase all the evolution lies. Cathryn is very naïve about the curriculum. She thinks that the curriculum isn’t sensitive to the religious beliefs of teachers and learners. She mentions that the curriculum is polluted with evolution, showing her strong objection to the teaching of evolution.

In stark contrast with the Muslim and Christian teachers and learners Reddy (2012) found in her study on Hindu teachers and learners that they find little or no conflict with their religion and evolution. This is mainly due to the fact that the theory of evolution and the Hindu faith share many themes. For instance, Hinduism subscribes to the notions of reincarnation and avatars, that can both be linked to evolution. Most Hindus believe in reincarnation of the soul, and this soul is every time re-born into a new physical body. Since they believe in “spiritual evolution”, where the soul every time that it is reborn shows higher levels of “Karma”, most Hindus have little problem in believing in physical evolution. The teachers and learners could easily assimilate the new information into their worldviews whereas their Muslim and Christian counterparts had to accommodate the new information into their worldview creating tension and conflict.

What is evident from all three studies is that teachers and learners have many misconceptions with regards to the theory of evolution. These studies also flag that there should be a sensitivity when teaching evolution, since where there are strong (fundamentalist) religious viewpoints, radical conceptual change is needed, where “hot” factors (such as religious objections) undermine true conceptual change.

3.7. Comparing these data to similar studies in the USA

How does this data compare to studies in the USA? Amongst our sample group, there were a number of teachers who did not hold a bachelor’s degree in life sciences. One therefore understands why so many teachers have the misconceptions regarding evolution. Interestingly, though, in a similar study by Nehm & Schonfeld (2007) in the USA, 95 % of the teachers had bachelor’s degrees in biology. Nevertheless, most of these USA teachers also held diverse and abundant misconceptions about evolution and natural selection. Common teacher misconceptions about evolution were:

- Evolution can’t be proven. It is a weak scientific idea because it is a ‘theory’.
- Transitional intermediates are missing from the fossil record.
- All mutations are harmful, and cannot give rise to new traits.
- Humans and dinosaurs coexisted (Nehm & Schonfeld, 2007).

- Regarding natural selection, a common misconception is that traits appear when they are needed, and that the environment causes evolutionary change.

Most of these misconceptions were also prevalent amongst our sample group.

In the USA creationism remains overwhelming popular with the public (Moore, 2008). Creationism is also surprisingly popular among high school biology teachers throughout the USA. Studies indicate that about 30 % of Biology teachers in the USA teach creationism (Moore, 2008). According to Moore, the inclusion of creationism in biology classes results from four interacting forces:

- Pressure to teach creationism and/or avoid evolution (e.g. pressure from parents, or school pressure in dedicated Christian or Muslim schools)
- Teachers' acceptance of creationism and the rejection of evolution.
- Ignorance of the law. Moore (2008) states that most biology teachers do not know that US courts have ruled that 'creation science has no scientific merit or educational value as science because it is simply not science'.
- Teachers' religious beliefs. The teachers most likely to include creationism in their courses are also most likely to have strong religious convictions.

International research shows that, whereas short learning programmes on evolution most often result in statistically significant gains in teacher knowledge of evolution and the nature of science, and in a significant decrease in misconceptions about evolution and natural selection, teachers' post-course preference positions and beliefs often remain unchanged (Nehm & Schonfeld, 2007). In many studies the majority of life sciences teachers still prefer creationist and anti-evolutionary ideas to be taught in schools, even after such interventions. Nehm & Schonfeld (2007) showed that 50 % of biology teachers preferred that learners be taught some amount of creationism in schools.

4. Discussion

From the data, it is clear that some teachers find it difficult to teach evolution, based on a lack of PCK, but also because of their religious views.

4.1. What if two parallel epistemologies exist- is radical conceptual change possible?

South Africa is a young democracy, and many older teachers still carry the scars of an apartheid regime. This, combined with the lack of cognitive understanding of what evolution and natural selection mean, and the myriad of misconceptions that teachers have, probably explains the comments made by a few black teachers that evolution is a 'racist theory'. During a University of Johannesburg short learning programme, snippets from the National Geographic DVD, *Tiny*

Humans: Finding Hobbits in Flores, was shown. The DVD traces the origin of tiny prehistoric humans somewhere on an Indonesian island. They are depicted as short and dark-skinned people. This offended some black teachers. They said that evolution was a racist theory. The *Mail and Guardian* (26 October 2007) reported on this: “*It terribly undermines black people. It means blacks were apes, they said*” (Mohlala, 2007). In a similar manner, one needs to view the religious objections that teachers have.

Clearly the NCS expects learners to be able to apply the principles of evolution to their daily lives. They should, for instance, realize that the breakfast cereals they have for breakfast are made from grains that evolved over time, and that new flu vaccines need to be developed every year, because viruses constantly change. When considering the teaching of evolution in our schools, distinction should be made between the *exchange value* of learning about evolution (where the aim for learning is to, for example, pass a test), and having *use value* (where learners will apply this knowledge in their daily lives) (Barab & Roth, 2006). Are teachers objective enough to facilitate this in such a way to achieve use value? One of the teachers in our research indicated that she will teach evolution “because it is the law”- it is against her religious beliefs, and one can question whether she will objectively facilitate this in her classroom. Here is evidence of exchange value, but little use value. The emphasis should be on what Barab & Roth (2006) call helping learners to engage *affordance networks*. Affordance networks can be described as the collection of facts, concepts, tools, methods, practices and people that are viewed as necessary toward obtaining a goal. These affordance networks are culturally determined.

Every learner has an effectivity set (skills). An effectivity set constitutes those behaviours that an individual can produce as to realize affordance networks (Barab & Roth, 2006). This resembles Shaffer’s (2004) notion of epistemic frames. Experts, in this case, evolutionary biologists, perceive the world differently from novices. Shaffer suggests that an important part of learning is to support the learner’s adoption of a new way of knowing, more in line with that of the expert. Every learner also has a life-world. A life-world contains those objects and phenomena that are relevant to the acting individual because of the individual’s effectivity sets. An affordance network may or may not become part of a learner’s life-world.

The life sciences teacher, through mediation such as scaffolding, should support the learners in developing an appreciation for, and resonance with, networks that are defined by a professional community (in this case, the NCS/ CAPS for life sciences, developed by the Department of Education). From the feedback received from teachers in the questionnaires and interviews, it is clear that many teachers experience problems in teaching evolution to learners. One teacher commented “*How can I be neutral- in my view it is a case of teaching ‘evolution’*”. Another teacher spoke about ‘*devolution*’.

The studies of Naude (2013) and Yalvac (2011) emphasized that, where there is a strong (fundamentalist) worldview, radical conceptual change is needed, and very often two parallel epistemologies exist in such people: a creationist worldview, and evolution as a conflicting theory, which is not accepted (or assimilated into the dominant worldview). Pintrich, Marx and Boyle (1993) state that we often look at conceptual change from a “cold”, and only cognitive lens. These researchers are of the opinion that controversial conceptual change should be viewed from the perspective of hot conceptual change. These “hot” factors include societal factors, religion, the influence of religious leaders, etc, making conceptual change a much more complicated process, as when viewed through a “cold” lens. Hynd (2003) further alludes to the fact that true conceptual change also means *acceptance* of evolution. According to Hynd (2003) no conceptual change therefore takes place, if a teacher or learner engages with evolution, but does not accept it. This is an aspect that needs attention during professional development programmes for teachers.

4.2. Teacher professional development within communities of practice

This research has shown that teachers’ PCK in teaching evolution should be developed, and they need to resolve the many religious objections and misconceptions that they (and their learners) hold. Teachers need assistance in teaching evolution in their classrooms, both in terms of pedagogy and biological content. Once-off approaches such as a single workshop are not sufficient. The role of communities of practice in the professional development of teachers is currently underplayed, and the naïve viewpoint that short workshops can be a ‘quick-fix’ remains. Subject advisors could assist in identifying keystone species that can help teachers to cope with the challenges they face.

Rogan and Grayston (2003) used an analogy to Vygotsky’s zone of proximal development, namely a zone of feasible innovation (ZFI). Innovation is most likely to take place when it proceeds just ahead of existing practice, which is within the zone of feasible innovation. Implementation of an innovation should occur in manageable steps. Teachers should further experience innovations first-hand, rather than be lectured to on its aims, structure and jargon.

Rogan and Grayston (2003) have described four levels of professional development programmes, based on the principle of the zone of feasible innovation:

- Level 1: Information on policy and expected changes are presented to teachers. Typical mode is a short, one-shot workshop.
- Level 2: Examples of ‘new’ practices as suggested by the policies are presented to teachers, who are given the opportunity to engage in these practices in a simulated situation. Typical mode is a series of workshops lasting for one year.
- Professional development is designed in the school context. Typical mode consists of both external and school-based INSET for two to three years.

- Ecologies of practice take full responsibility for their own professional growth. Keystone species in these ecologies of practice are valuable as catalysts of colleagues' professional development.

This author is therefore of the opinion that teachers' PCK on evolution teaching can best be developed within well-functioning communities of practice. When engaging with evolution teaching and PCK development, innovative pedagogies should be used. Bybee (2002) suggests the use of historical case studies and narratives to teach evolution. This allows learners to follow the development of different aspects of the theory in the form of a story, hence assisting in the internalisation of concepts. This will also act as a window into the methods scientists use to construct knowledge. Van der Mark (2012) used narratives and concept cartoons in a professional teacher education programme, with great success. This allowed teachers to explore other strategies that could be used in teaching evolution. Despite the limited intervention (two Saturday morning workshops), Van der Mark showed that teachers gained a better understanding of evolution, by engaging with two pedagogies: narratives and concept cartoons. The use of such strategies can be very useful in the classroom.

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