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Paleontologia e Tecnologias Digitais: Abordagens Metodológicas no Ensino de Ciências

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A B S T R A C T

Digital Information and Communication Technologies (DICT) and Active Methodologies (AM) are powerful tools for the teaching-learning process. When used together, they can enhance the understanding of topics related to paleontology in science education. Currently, the daily use of smartphones and other technologies is present in the school environment and students' everyday lives. This work aims to map methodological approaches that address paleontology topics and the use of digital technologies in science education. The methodology involved a qualitative, basic, and exploratory bibliographic review, using mapping and narrative review. In addition to virtual games, it was found that virtual museum visits and the use of films can be effective alternatives for science teaching. The results reveal a significant lack of virtual applications in the field of paleontology. However, it is believed that digital technologies can work together to bring the context of paleontological topics into science education and the classroom. It is expected that the use of virtual didactic methodologies will increasingly be adopted in school environments, making these alternatives more present in formal educational contexts.

R E S U M O

As Tecnologias Digitais da Informação e Comunicação (TDIC) e as Metodologias Ativas (MA) são ferramentas poderosas para o processo de ensino-aprendizagem. Quando utilizadas em conjunto, elas podem potencializar a compreensão de temas relacionados à paleontologia no ensino de Ciências. Atualmente, o uso diário de smartphones e outras tecnologias está presente no ambiente escolar e no cotidiano dos alunos. Este trabalho tem como objetivo mapear propostas metodológicas que abordem temas da paleontologia e o uso de tecnologias digitais no ensino de Ciências. A metodologia envolveu uma revisão bibliográfica qualitativa, básica e exploratória, utilizando mapeamento e revisão narrativa. Além dos jogos virtuais, verificou-se que visitas virtuais a museus e o uso de filmes podem ser alternativas eficazes para o ensino de Ciências. Os resultados evidenciam uma carência significativa de aplicativos virtuais na área da paleontologia. No entanto, acredita-se que as tecnologias digitais podem trabalhar em conjunto para trazer o contexto de temas paleontológicos para o ensino de Ciências e para a sala de aula. Espera-se que a utilização de metodologias didáticas virtuais seja cada vez mais adotada nos ambientes escolares, tornando essas alternativas mais presentes nos contextos formais de educação.

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Introduction

Although paleontology has great scientific relevance, it is often neglected in the school context, which highlights the need to promote its study among both students and the general public. Understanding this science can broaden horizons for topics that, although rarely covered in the classroom, are fundamental to understanding the origin and evolution of life on Earth (Godoy et al., 2017). In this sense, it is essential to point out that, according to the Law of Guidelines and Bases of National Education (LDB) and the National Curriculum Parameters (PCNs), paleontology is foreseen as an integral part of the Science curriculum in basic education (Brasil, 1998).

However, the approach to this subject in schools is often superficial, which results from the lack of prominence in teaching materials, such as textbooks and handouts (Bizzo, 2009). This lack of a more in-depth approach reflects a flaw in curriculum planning, which limits the potential contribution of paleontology to the development of scientific and critical thinking in students. Curiously, the new National Common Core Curriculum (BNCC) for Primary Education does not explicitly mention the teaching of paleontology. On the other hand, in the BNCC for Secondary Education, the study of fossils is incorporated as a specific competence, promoting debate, improving critical and scientific thinking, as well as familiarizing students with scientific terminology and language, encouraging reading and study through articles, books and specialized magazines (Brasil, 2010).

This gap in the teaching of paleontology in Brazil can be attributed mainly to the lack of adequate organization in the National Curriculum Parameters. Although there is formal provision for its teaching, this area of knowledge ends up being undervalued (Duarte et al., 2016), losing space to other content. Studies indicate that presenting paleontological concepts in a playful and interactive way, especially in non-formal education environments, has the potential to arouse greater interest and engagement among students in this subject.

In addition, the COVID-19 pandemic, caused by the SARS-CoV-2 virus, has brought significant changes to the dynamics of teaching. The suspension of face-to-face classes was a necessary measure to control the spread of the virus, and remote teaching emerged as a viable solution for the continuity of educational activities (Brazil, 2020). In the context of this pandemic, which lasted from 2019 to 2023, teaching faced the challenge of maintaining the flow of knowledge, requiring new teaching strategies, especially in the virtual environment.

Given the importance of paleontology and the limited space it occupies in the school curriculum, this study proposed developing innovative virtual methodologies for the dissemination of paleontological teaching. The aim of this study was to develop didactic proposals that could be applied in remote teaching environments, favoring access to this content through interactive and attractive strategies suited to the digital context.

Methodology

This research is characterized as a literature review with a qualitative approach, using a documentary study method that includes the analysis of exploratory and intervention research. This type of research seeks to synthesize primary studies previously carried out, offering a comprehensive and up-to-date view of the subject in question. In addition to consolidating the available evidence, this study aims to provide an up-to-date version of the information and promote the implementation of effective teaching interventions, as well as identifying relevant gaps for future research based on consistent data (Mendes et al., 2008).

Studies were selected for this literature review by searching open-access databases, focusing on works published in Portuguese on Google Scholar. Specific descriptors were used to collect the material, which made it easier to locate and select the relevant bibliographic sources. The descriptors used in Portuguese were: Science Teaching, Paleontology Teaching and Remote Teaching.

The data analysis stage followed the model proposed by Whittemore and Knafl (2005), which consists of five fundamental steps: formulating the problem; retrieving and reading the references to identify information relevant to the topic; establishing relationships between the data obtained and the proposed problem; analyzing the consistency of the information provided by the authors; and, finally, interpreting the results.

The reading was initially exploratory, with the aim of quickly evaluating the bibliographic material and checking the relevance of the works consulted to the proposed topic. After this selective screening, a more detailed analytical reading of the selected texts was carried out. At this stage, the information obtained was organized and summarized in such a way as to provide clear answers to the research problem.

Finally, interpretative reading made it possible to accurately identify the authors' contributions in relation to the problem studied, offering an appropriate solution to the proposed questions. During this process, notes were made on elements that could represent solutions to the problem, always in line with the objectives of the study (Whittemore; Knafl, 2005).

Results and Discussion

The research began with a search for studies that presented educational proposals in the area of paleontology aimed at teaching science, considering different levels of schooling. The aim was to identify content that could be adapted to the use of digital technologies, facilitating distance learning. From this search, articles were selected that offered pedagogical approaches that could be adapted to the context of home teaching.

Among the works found were didactic methodologies using the following themes: exhibitions, documentaries and educational games. Each author proposed different teaching-learning methods, which will be discussed and analyzed in the course of this study. Based on

these analyses, didactic strategies will be suggested, by means of methodological adaptations, to enable the teaching of paleontology in the virtual environment.

Visit to Paleontological Museums

According to Pádilla (1998), as in other Latin American countries, science museums in Brazil have received a large number of visits from students. Over the years, these spaces have become increasingly sought after by teachers from different areas of knowledge, with a view to better use by students. On the other hand, museums have been striving to improve their facilities, creating specific programs, support materials, meetings to plan itineraries and strategies to optimize the educational use of the environment.

The interaction between school and museum reveals the existence of two distinct points of reference, and some authors have investigated the peculiarities that differentiate them, highlighting their particularities. The school environment offers routines and habits aimed at acquiring knowledge, with well-defined times for each activity (Gouvêa, 1997). This pre-established structure is fundamental for the teaching-learning process to take place effectively. Teachers and students generally adhere to these routines in order to ensure that knowledge is built up in an organized manner.

On the other hand, Allard et al. (1996) summarize some of the main differences between the school and the museum: while the aim of the school is to educate and instruct, the museum focuses on collecting, preserving, studying and exhibiting objects. Furthermore, in schools, the public is made up of captive individuals organized by age or background, while in museums, the public is more heterogeneous, varying in age and background, and made up of free and temporary visitors.

Many cultural institutions, such as museums, look to the school environment to guide the development of their activities, as they are concerned about the quality of the knowledge transmitted to the public. However, each cultural space has its own ways of acquiring and passing on this knowledge. Museums, in particular, have a unique dynamic that offers a different interaction experience compared to the school environment.

Given the frequency with which educational institutions visit museums, it is crucial to recognize that these spaces can go beyond the role of complementing school teaching. The objects on display in museums provide experiences that instigate curiosity, promote questioning and encourage student motivation, enriching the learning process.

Virtual Tours of Paleontological Museums

In recent years, museums have undergone significant transformations, seeking to adapt to the new demands of society and explore more accessible forms of interaction with the public. According to Moutinho (1994), traditional Museology has not evolved into a new Museology, but rather society itself has transformed the parameters that guide Museology. The

COVID-19 pandemic was one of those factors that accelerated the adaptation of many museums, forcing them to seek innovative solutions to continue their educational mission.

With the advent of the internet and communication technologies, a new model for visiting museums has emerged, enabling new forms of interaction and experiences for visitors. The virtual visit is one of these technological innovations, making museum collections accessible remotely. This resource not only extends the reach of institutions, but also allows the public to have contact with cultural and scientific heritage without the need for a physical visit.

An example of this is the virtual visit to the National Museum in Rio de Janeiro, which offers an interactive opportunity to explore its collection, even after the destruction caused by the fire in 2018. This tool reflects the possibilities that technological advances have brought to the preservation of memory and the strengthening of Brazilian cultural identity.

Museums have increasingly improved their virtual exhibitions, using interactive digital devices, access to online materials and even pieces that can be digitally manipulated by the public. These initiatives transform the visitor's experience, making them more active in the construction of knowledge, rather than just a passive recipient of information.

Although the virtual visit does not replace the face-to-face experience, it offers a valuable alternative for those who do not have physical access to the museum. In addition, it serves as a powerful pedagogical tool for teachers, allowing students to explore the content in a dynamic and accessible way, without the need to travel or acquire specific materials. These visits can be carried out synchronously, with the teacher guiding the virtual tour during class, using screen-sharing resources.

Museums and schools, although with different objectives, complement each other in the educational process. Virtual visits to paleontological museums give students the opportunity to experience the study of paleontology, providing a more tangible understanding of a subject that often seems distant from their reality.

Steps to Organize a Virtual Visit

To organize a virtual visit to a paleontological museum, the teacher must follow a few basic steps. Firstly, it is advisable to access the website of the chosen museum to familiarize yourself with its history and collection. Researching the fossils, replicas and documents available is essential to ensure that students have an enriching experience.

Visiting the virtual museum beforehand is crucial to identifying the most relevant points to be explored with the students. Through simple searches, such as “virtual museum of paleontology”, it is possible to find options such as the Irajá Damiani Pinto Museum of Paleontology, at the Federal University of Rio Grande do Sul (UFRGS), which offers a virtual tour, allowing the exploration of fossils more than 4.6 billion years old.

This preparation ensures that the virtual visit is well structured and that students can maximize the educational experience, integrating palaeontology learning in an engaging and accessible way.

To create a comfortable learning environment, the most important thing is to start by greeting the students, encouraging them to express themselves individually or collectively, without the fear of being evaluated. The teacher should act as a facilitator, promoting group integration and engagement. The first step is to have an introductory conversation, where it is interesting to discuss the group's expectations of the museum visit. This moment serves to survey the knowledge previously acquired, to confirm and expand this knowledge, as well as to get their first impressions of the virtual site and the first pieces of the collection to be explored.

Right from the start, the teacher should ask questions that stimulate dialog between the students. Based on the answers, it will be possible to identify which fossils or museum pieces deserve greater emphasis, as well as the concepts that need to be addressed, developed or avoided in order to engage as many students as possible in the activity. To this end, it is essential that this initial period is used as a space for discussion and reflection, where the virtual tour facilitates the consideration of each student's different perspectives. This welcoming moment should last between 10 and 15 minutes, and at the end of this stage, the virtual tour itself should begin.

It is important to note that during the tour, it is recommended that the teacher presents four to five fossils, objects, images or concepts in more detail. The aim is to pause at each item viewed to make careful observations and promote an exchange of impressions between the students. This moment is essential to strengthen understanding and connection with the content.

In addition, after the guided tour, the teacher can release the museum link so that the students can freely explore the virtual environment for 5 to 10 minutes. This time gives students the opportunity to absorb more knowledge and make discoveries on their own. Afterwards, the group is brought back together for a more in-depth discussion, sharing impressions and reflections on what has been seen.

It's important to note that the selection of fossils and the focus of the content vary according to the age group of the students. For example, elementary school students can be asked to identify the item that most caught their eye, while secondary school students can use more scientific language to describe their observations. The teacher should always try to contextualize the objects seen and relate them to the content previously worked on.

In short, the end of the visit is just as important as the previous stages. At this point, the teacher should guide the students to make a qualitative assessment of their experience in the museum, even if it was virtual. Each student's impressions will be the parameter for identifying what has been learned. More persuasive questions can be asked, such as: If you

were the museum curator and had to choose just one fossil to raise public awareness about the importance of preservation, which one would you choose? Why?

There are numerous activities that can be developed to continue and deepen the themes worked on during the visit. It's worth recapping the highlights of the visit with the class and reflecting on the fossils seen. In addition, the teacher can expand the analysis by bringing in fossils or content not covered in the museum, promoting a broader discussion and encouraging continued interest in the topic.

The aim of this moment is to consolidate the knowledge acquired during the visit, creating a discussion where even students who didn't take part in the guided tour can get involved and reflect on the topic. The virtual experience is a valuable opportunity to stimulate learning in an innovative format, promoting continued interest in scientific topics such as paleontology

Games

Several authors highlight the importance of games in the learning process, contributing not only to students' creativity, but also to the development of independence, autonomy, socialization and cooperation (Cotonhoto et al., 2019; Caroline, 2021). Strategically, games can transmit knowledge in a dynamic way, making abstract content, such as paleontology, more concrete and accessible in a fun way (Cotonhoto et al., 2019).

According to Amorim et al. (2016), both primary and secondary school students can acquire knowledge through games. However, in order to expand logical understanding, it is necessary to use good tools and a solid pedagogical foundation. The construction of knowledge can be facilitated by the use of games, as long as they are adapted to the students' level of understanding, including in early childhood education (Mello et al., 2005).

The changes resulting from the pandemic have required classes to be adapted and teaching methods and tools to be improved. Technology has advanced in this process, altering the way in which knowledge is reflected on, shared, transmitted and produced. Educational challenges have been launched, leading to reflection on more active, critical and appropriate methods for the current school context (Sousa et al., 2011).

Most students are immersed in a technological environment, with a strong connection to mobile devices. The expansion of technologies has brought significant improvements to cell phones, such as better graphics and sound, and the development of a wide range of virtual games on different platforms (Prensky, 2012). These games offer immersive experiences, with beautiful landscapes, engaging stories and interactions that bring the player closer to the content. As a result, researchers have been investigating the potential of digital games as tools for teaching and learning (Kirriemuir; McFarlane, 2004).

Although educational interaction between teachers and students in various areas of teaching still relies heavily on traditional methodologies, especially in remote classes, this

approach can become tiresome and monotonous. Antunes (2002) points out that play is an essential educational medium, promoting integral and dynamic development in the cognitive, affective, social, linguistic, moral and motor fields. In addition, games contribute to the development of self-sufficiency, creativity, criticality, responsibility and cooperation.

In addition, playful activities can also be made up of digital games, which present a sequence of challenges, where players make decisions to achieve objectives within the established rules. Digital games provide a dynamic and attractive approach to student understanding in distance learning. By using not only speech, but also visuals and logical thinking, games offer a more fun and effective learning opportunity.

These games allow students to acquire autonomy and greater interaction with the content covered, as in the case of paleontology. The use of images and simulations can help with non-verbal communication, facilitating teaching even outside the physical space of the school.

Documentary/Film

Arousing students' interest and curiosity during lessons can be a constant challenge for teachers. According to Demo (2000), problems at school can occur due to a lack of enjoyment caused by the inadequacy of the school environment to students' social and cultural expectations. Although interest in learning is the student's responsibility, the teacher plays a fundamental role in stimulating this interest.

Santos and Silva (2011) point out that the use of playful activities as a teaching strategy should generate curiosity, capture attention and instigate students to take an interest in what is being proposed. This makes it easier to understand the content and keeps students entertained, curious and focused. Educating doesn't just mean transmitting information or showing a single path, but helping students to become aware of themselves, others and society, offering tools so that they can choose their own path, compatible with their values and worldview (Rojas, 2002).

According to Zanella et al. (2008), each student has different ways of learning. For this reason, the teacher should explore various resources to develop scientific concepts and emphasize how these concepts are part of our lives. Often, students don't problematize or question the content, limiting themselves to receiving it in a way that is disconnected from the reality in which they live.

Among the teaching resources that can facilitate learning, the use of films and documentaries in the classroom stands out. Oliveira (2006) observes that although viewers know that the images are edited, the magic and enchantment of cinema makes them react as if they were in front of reality. Several studies have explored the relationship between cinema and the teaching of biological sciences. For example, Gomes-Maluf and Souza (2008) used the movie “Jurassic Park” to bring science fiction closer to science teaching.

The use of the movie can be structured in a didactic sequence, taking into account the historical context and geological time portrayed. The activity should begin with a slide show on the geological eras and the characteristics of the fauna and flora of each era, to clarify points covered in the movie.

Inserting science fiction films at the beginning of activities can trigger learning and organize the concepts to be explored. Using the movie after the concepts have been explained can raise doubts about the theoretical validity. It is therefore recommended to start with the film in order to contextualize the concepts that will be worked on in class, turning it into an effective methodological tool for teaching Science.

Final considerations

It is expected that, through the development of this work, the use of virtual teaching methodologies will be increasingly adopted in the school environment. Virtual visits, films, documentaries and games should become an integral part of formal educational contexts, especially in the areas of Paleontology, covered in the subjects of Science in Elementary School and Biology in High School.

These tools offer great richness, allowing several areas of knowledge to be contemplated and discussed throughout each methodological alternative. This represents an opportunity to promote interdisciplinary teaching, in addition to encouraging the use of audiovisual resources by teachers of other subjects. This use optimizes time both inside and outside the classroom, in a creative and engaging way.

Based on this research, it is also highlighted the lack of applications that address the paleontological theme effectively. Among the terms used in the searches and the established criteria, it was observed that the applications analyzed have varied purposes, and can be used as teaching resources in content related to Paleontology, assisting in conceptual classes.

It is also important to emphasize the importance of dynamic classes, mediated by the teacher, that highlight the most relevant aspects of each activity with the students. This can contribute to a more comprehensive view of Paleontology, awakening curiosity and interest in students, in addition to promoting the development of critical thinking. In this way, students become more able to discuss controversial topics as citizens aware of their duties and rights.

Therefore, it is believed that it is possible to experience a happy, playful school that, whenever possible, promotes interest in paleontological knowledge in the teaching of Biological Sciences.

REFERENCES

Allard, M., Larouche, M. C., Lefebvre, B., Meunier, A., & Vadeboncoeur, G. (1996). La visite au musée. Réseau, 14-19, Décembre 1995/Janvier.

Antunes, C. (2002). Novas maneiras de ensinar: novas formas de aprender. Porto Alegre: Artmed.

Amorim, M. C. M. S., Oliveira, E. S. G., Santos, J. A. F., & Quadros, J. R. T. (2016). Aprendizagem e Jogos: diálogo com alunos do ensino médio-técnico. Educação & Realidade, 41(1), 91-115. http://dx.doi.org/10.1590/2175-623656109

Brasil. (1998). Ministério da Educação (Secretaria de Educação Fundamental). Parâmetros Curriculares Nacionais: Ensino Fundamental: Ciências. Brasília: MEC/SEF. http://portal.mec.gov.br/seb/arquivos/pdf/ciencias.pdf

Brasil. (2010). Ministério da Educação. Secretaria de Educação Básica. Diretrizes Curriculares Nacionais para a Educação Infantil. Brasília: MEC, SEB. http://portal.mec.gov.br/dmdocuments/diretrizescurriculares_2012.pdf

Brasil. (2020). Ministério da Educação. Portaria Nº 343, de 17 de março de 2020. Dispõe sobre a substituição das aulas presenciais por aulas em meios digitais enquanto durar a situação de pandemia do Novo Coronavírus - COVID-19. https://www.in.gov.br/en/web/dou/-/portaria-n-343-de-17-de-marco-de-2020-248564376

Caroline, T. R. C. (2021). A importância de jogos e brincadeiras na educação infantil. Saberes Docentes em Educação, 5(1). https://maceio.al.gov.br/uploads/documentos/1-A-IMPORTANCIA-DOS-JOGOS-E-BRINCADEIRAS-NA-EDUCACAO-INFANTIL-1.pdf

Cotonhoto, L. A., Rossetti, C. B., & Missawa, D. D. A. (2019). A importância do jogo e da brincadeira na prática pedagógica. Constr. psicopedag., 27(28). https://pepsic.bvsalud.org/scielo.php?script=sci_arttext&pid=S1415-69542019000100005

Demo, P. (2000). Educação e conhecimento. Relação necessária, insuficiente e controversa (3rd ed.). Petrópolis, Rio de Janeiro: Vozes.

Duarte, S. G., Arai, M., Passos, N. Z. G., & Wanderley, M. D. (2016). Paleontology in Elementary Education of the State Schools of the Rio de Janeiro: a Critical

Evaluation. Anuário do Instituto de Geociências - UFRJ, 39(2), 124-132. https://doi.org/10.11137/2016_2_124_132

Godoy, P. L., Ferreira, G. S., Dassie, E. C. G., Castro, A. C. M. G., & Hsiou, A. S. (2017). Formação continuada no ensino de Paleontologia, pelo exemplo do projeto "Oficina de Paleontologia: os fósseis dentro da sala de aula". Revista de Cultura e Extensão USP, 17, 11-19. https://doi.org/10.11606/issn.2316-9060.v17isupl.p11-19

Gouvêa, G. (1997). O uso de jornais e revistas de divulgação científica no ensino de Ciências. In Atas do XII Simpósio Nacional de Ensino de Física. Belo Horizonte: SBF.

Gomes-Maluf, M. C., & Souza, A. R. (2004). A ficção científica e o ensino de ciências: o imaginário como formador do real e do racional. Ciência e Educação (UNESP. Impresso), 14, 271-282. https://doi.org/10.1590/S1516-73132008000200006

Kirriemuir, J., & McFarlane, A. (2004). Literature review in games and learning. FutureLab. https://telearn.hal.science/hal-00190453/document

Mendes, K. D. S., Silveira, R. C. C. P., & Galvão, C. M. (2008). Revisão integrativa: método de pesquisa para a incorporação de evidências na saúde e na enfermagem. Texto e Contexto Enfermagem, 4(17), 758-784. https://doi.org/10.1590/S0104-07072008000400018

Mello, F. T., Mello, L. H. C., & Torello, M. B. F. (2005). A paleontologia na educação infantil: alfabetizando e construindo o conhecimento. Ciência & Educação, 11(3), 395-410. https://doi.org/10.1590/S1516-73132005000300005

Moutinho, M. (1994). A construção do objecto museológico. Cadernos de Sociomuseologia, 4(4), 58. Lisboa: Universidade Lusófona de Humanidades e Tecnologia. https://revistas.ulusofona.pt/index.php/cadernosociomuseologia/article/view/244

Oliveira, B. J. (2006). Cinema e imaginário científico. História, Ciências, Saúde - Manguinhos, 13, 133-150. https://doi.org/10.1590/S0104-59702006000500009

Padilla, J. (1998). Museos y centros de Ciencia en México. In 50ª Reunião Anual da Sociedade Brasileira para o Progresso da Ciência, Natal, Rio Grande do Norte.

Prensky, M. (2012). Aprendizagem baseada em jogos digitais. São Paulo: SENAC.

Rojas, J. (2002). O lúdico na construção interdisciplinar da aprendizagem: uma pedagogia do afeto e da criatividade na escola. Rio de Janeiro: ANPED.

Santos, C. R. M., & Silva, P. R. Q. (2011). A utilização do lúdico para a aprendizagem do conteúdo de genética. Univ. Hum., 8(2), 119-144. https://doi.org/10.5102/univhum.v8i2.1586

Sousa, R. P., Miota, F. M. C. S. C., & Carvalho, A. B. G. (Eds.). (2011). Tecnologias digitais na educação. Campina Grande: EDUEPB. https://static.scielo.org/scielobooks/6pdyn/pdf/sousa-9788578791247.pdf

Zanella, E. Z., Christ, K. B., & Souza, L. C. (2008). Atividade com filme no ensino de Ciências – filme "Dinossauro". Instituto de Ciências Biológicas – Universidade de Brasília.

Whittemore, R., & Knafl, K. (2005). The integrative review: updated methodology. Journal of Advanced Nursing, 5(52), 546-553. https://doi.org/10.1111/j.1365-2648.2005.03621.x